Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

UNITED STATES
DEPARTMENT OF AGRICULTURE
LIBRARY



BOOK NUMBER 1.9603
P94
Ind-2
319297

GPO 8—7671

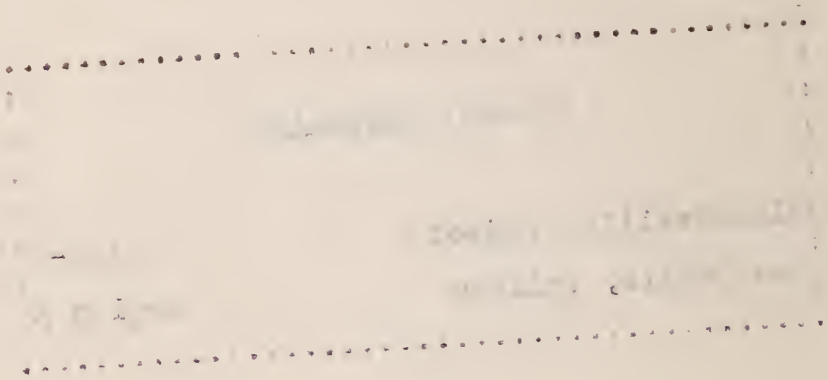
PROJECT MONOGRAPH

Blountsville Project — Ind-2

New Castle, Indiana — Region 3

LIBRARY
Soil Conservation Service
U. S. Department of Agriculture
Washington, D. C.

562157
Ag4 - 44



319297

CONTENTS

	Page
Introduction	3
Description of the area	4
Geology	4
Topography	6
The physical characteristics	7
Drainage	9
Climate	9
Original vegetative cover	10
Wildlife	11
Agricultural history	14
Indian occupation	14
Settlement	15
Early agriculture	15
Population trend	20
Land tenure	21
Social structure	23
Agricultural industries	23
Agricultural pattern	24
The conservation survey	26
Factors considered	26
How conducted	28
Soils	28
Slope	29
Erosion	30
Cover	31
Findings and related observations	31
The economic survey	50
Size of farms	50
Farm earnings	51
Land use	54
Source of income	54
Livestock	55
Pasture	57
Capital invested	57
Efficiency of operations	59
Suggestions for improvement--farm management standpoint	59
The erosion control program of the Service	60
Basic plan	60
Cooperating agencies	61
Land use capability	62
Land use and soil conserving measures	66
Application of soil conservation plan to a single farm	73

AUG 4 - 1941

Page

Surveys and special studies..... 90
Meadow establishment..... 90
Correlation of tree species to planting sites..... 93
Corn yields and erosion..... 100
Soil and water loss plots..... 102
Pasture fertilization..... 106
Accomplishments..... 107
Changes in the use of the land..... 107
Practices applied to cultivated land..... 111
Practices applied to pasture land..... 115
Practices applied to woodland..... 117
Practices encouraging wildlife..... 124
Spread of conservation practices..... 124
Problems encountered in fitting the conservation program to the land and to the people..... 127
Farmer attitude..... 127
The community viewpoint..... 130
Physical land characteristics and the livestock program..... 132
Problems requiring further study..... 134
Tillage implements..... 134
Small grain crops..... 134
Forage crops..... 135
The pasture program..... 135
Observations and recommendations of the Soil Conservation Service..... 136
The conservation attitude..... 136
Conservation action..... 138
Vegetative cover map based on original survey..... 139
Symbols for land use maps..... 140
Legend for conservation survey maps..... 141
Land use capability classes, Blountsville Project..... 145
Recommendations for land use capability classes..... 149

INTRODUCTION

A means of controlling the run-off of the 40 inches of rain that falls annually in central Indiana is the key to erosion control. Abundant rainfall is recognized as a natural advantage in central Indiana, but what often goes unrecognized is the fact that rainfall can and must be managed--for the maintenance of human welfare--through a permanent and profitable type of agriculture. Those who do recognize soil loss through erosion frequently discount its importance, or fail to connect the loss with the mismanagement of rainfall.

Nevertheless, it is a known fact that much land in this state which formerly supported people now has failed, because the prevailing system allowed soil loss. Although the farm operators have made general use of manure, crop residues, fertilizer, and lime for the improvement of the soil, they have frequently allowed unmanaged rainfall to defeat their purposes. On sloping land, the soil has been carried away much faster than it has been built up or improved.

This report describes the methods used and the success attained by a group of farmers in Henry County, Indiana, who have applied erosion control measures to their own land in cooperation with the Soil Conservation Service.

DESCRIPTION OF THE AREA

Geology

Geology has a profound influence on agriculture. In many cases it dictates the use which can be made of land. Most of central Indiana is within the Tipton Till Plain (fig. 1) described by Logan[1], "Comprising approximately 11,900 square miles, the largest physiographic division of the state, occupying nearly one-third of the entire area of the state. It is characterized by a deep covering of glacial material, the surface of which is mainly flat or very gently rolling." Two wells drilled in Prairie Township show the glacial drift ranging from 136 to 230 feet, and resting on limestone.

This glacial material is not soil but the raw material from which soil is made, and is often called parent material. The soil itself is seldom more than 3 feet thick and is usually recognized as two layers called topsoil and subsoil. Because of the characteristics of the parent material, climate, and original cover, newly cleared Indiana soils were moderately well supplied with the important plant nutrients, including nitrogen, phosphorous, and potassium. They were also reasonably well supplied with calcium.

---

[1]Logan, W. N. 1922. Handbook of Indiana Geology. The Department of Conservation. Division of Geology.

REGION 3

INDIANA

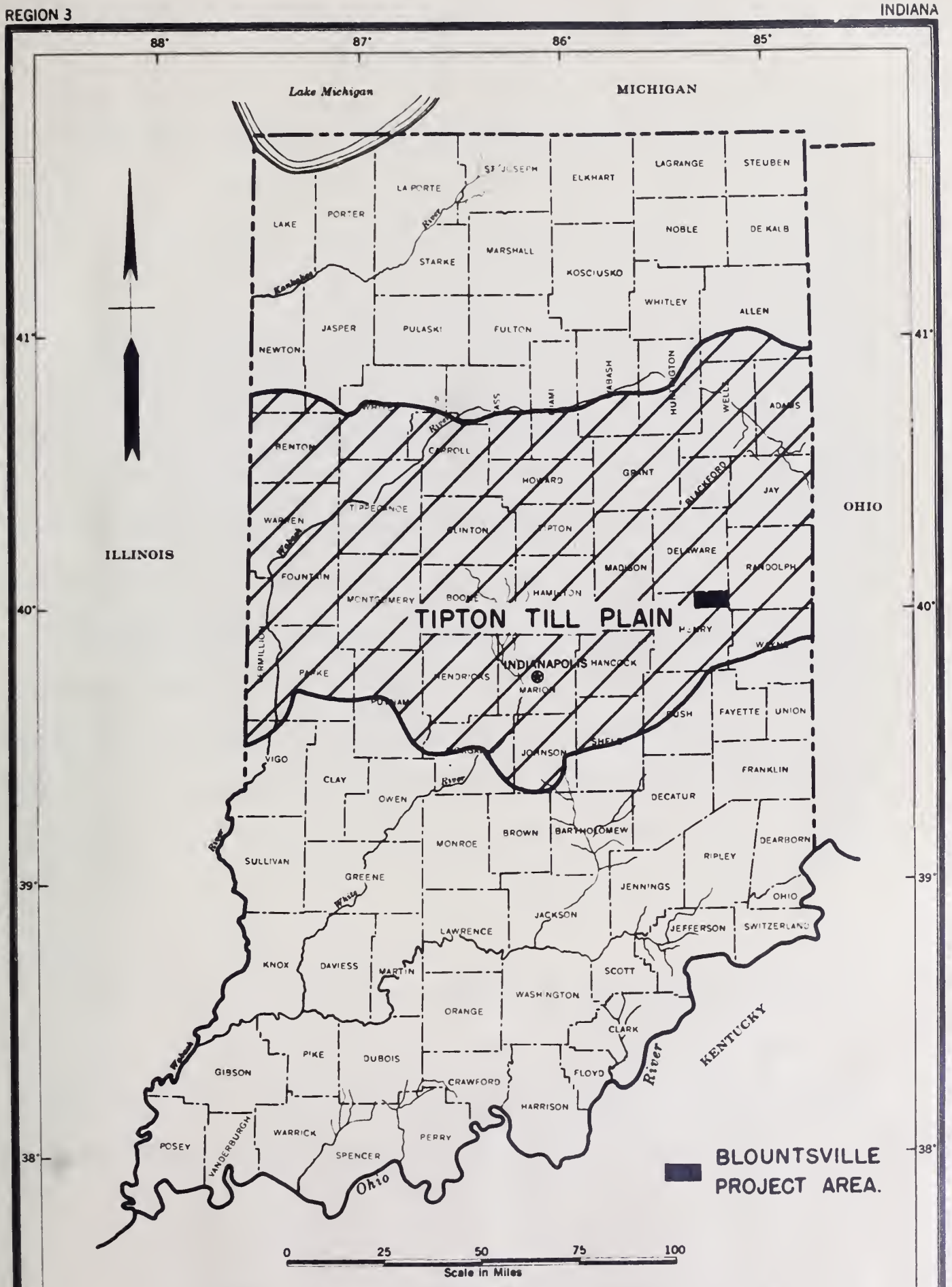


FIGURE 1. LOCATION OF PROJECT AREA IN THE TIPTON TILL PLAIN.

Topography

Topography has also had an influence on the soil during the formation and continues to influence its use for agricultural purposes. Logan says, speaking of northeastern Henry, southeastern Delaware, Randolph, and northern Wayne Counties, "Here the Champaign and Bloomington moranic systems are quite prominent and a great mass of moranic accumulation gives rise to the highest area in the state. Over considerable of this great moranic pile the local relief is not great; the knolls rise as gently eminences and the slopes to the streams are not abrupt. In northern Henry County in the vicinty of Mt. Summit, a system of ridges and knolls rises rather abruptly 75 to 100 feet above the bordering marshy plain of the headwaters of Blue River. The moranic mass is thickly strewn with boulders." The elevation above sea level at Mt. Summit is 1,104 feet.

The Blountsville project consists of 45 square miles in the northeast corner of Henry County (fig. 1). It is bounded on the north and on the east sides by the county line, on the south by a line from Mt. Summit east 9 miles to the Randolph County line, and on the west by a line from Mt. Summit north 5 miles to the Delaware County line. It consists of all of Stony Creek and parts of Prairie and Blue River Townships.

Because of its position in relation to the highest point in the state, the project area is the source of three important drainage systems. These are the Flat Rock River, Big Blue River, and Buck Creek, a tributary of the west fork of White River.

The Physical Characteristics

The physical characteristics of the project are comparable to those which exist along the drainage courses throughout central Indiana. Level to rolling fields, lacking in uniform slopes, and used for the production of such crops as corn, small grain, and hay in rotation, characterize the upland. The valleys along the main drainage courses are wide post-glacial stream beds. They are made up of dark, almost level soils which are used largely for the production of corn each year. The valleys are separated from the uplands by well-drained soils which lie on steep slopes ranging from 10 to 40 feet of fall to each 100 feet. These bands of steep slopes occupy a strip about one-half mile wide on each side of the valley. Some of this land is now being cultivated; most of it, however, has been converted to pasture following a period of cultivation which lasted about 50 years. A relatively small amount is in woodland. (See Figure 2).

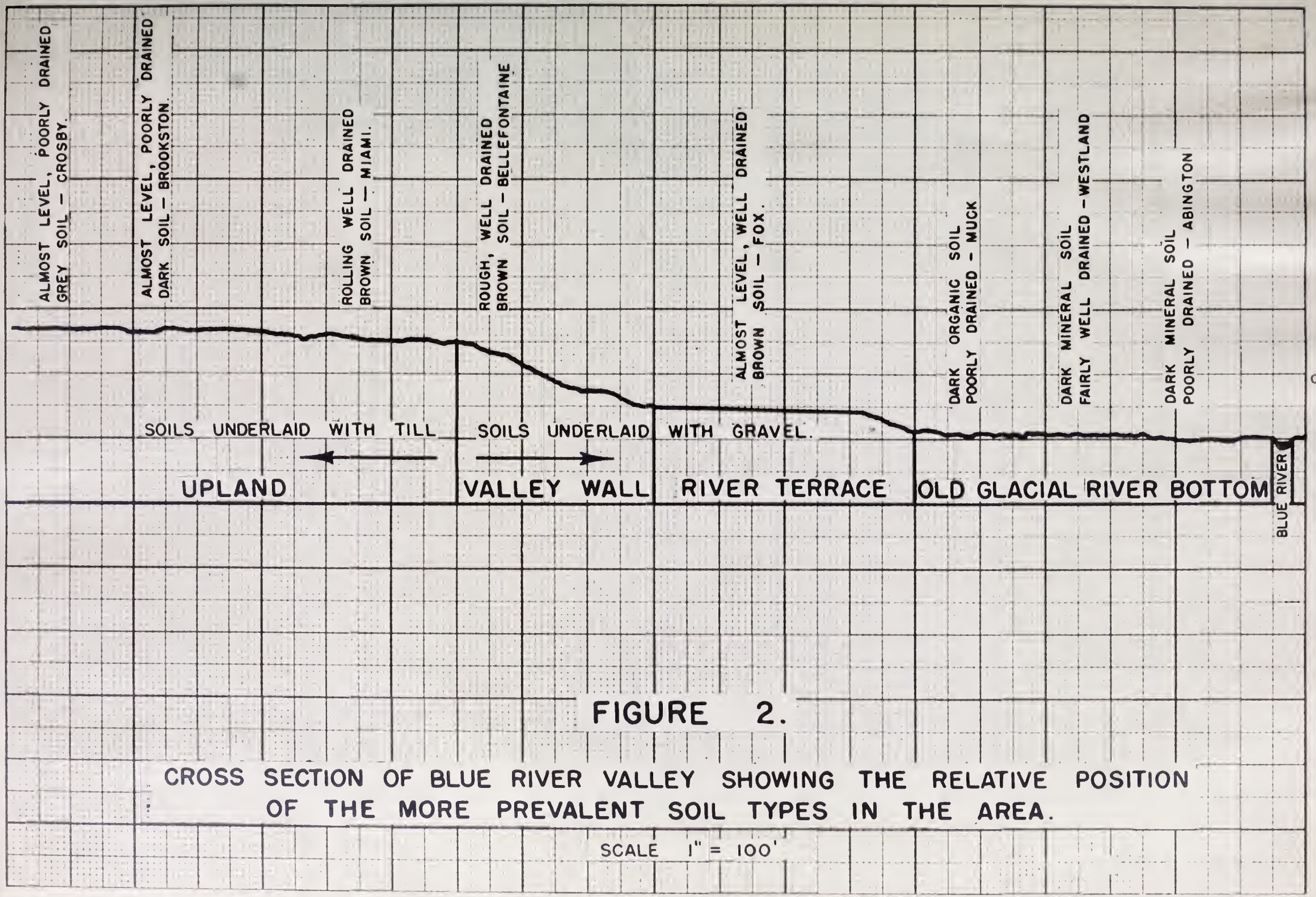


FIGURE 2.

CROSS SECTION OF BLUE RIVER VALLEY SHOWING THE RELATIVE POSITION OF THE MORE PREVALENT SOIL TYPES IN THE AREA.

SCALE 1" = 100'

Drainage

Concerning drainage of the Tipton Till Plain in general, Logan says, "The divides are flat and sometimes swampy, the streams are muddy and sluggish. The valleys begin in the uplands as scarcely perceptible grooves in the compact boulder clay, widen much more rapidly than they become deep, and seldom reach down to the rock floor."

Because of the imperfect drainage much tile has been used on the upland and a great many of the main drainageways have been dredged. Blue River Valley in the project area owes its existence largely to work done by the glacial waters. Blue River and Buck Creek have modified it little since the glacial period. The present streams are but a feeble representation of their predecessors.

Climate

The average annual precipitation at Muncie, Indiana (10 miles northwest from the center of the area) over a period of 22 years was 42.6 inches. Over the same period the average monthly precipitation, in inches, was: January 2.75, February 2.48, March 4.22, April 4.24, May 4.13, June 4.12, July 3.54, August 4.18, September 4.05, October 2.49, November 3.42, and December 3.

For a period of 36 years, the average length of the growing season was 166 days. April 30 was the average date for the last killing frost in the spring and October 13 was the first killing frost in the fall.

The climate is suitable for the production of corn, winter wheat, spring oats and such hay crops as red clover, alsike, alfalfa and timothy. The surface irregularities of the project area are small and exercise only a slight effect on its climate. Precipitation is fairly evenly distributed throughout the year. Somewhat more than one-half of the annual rainfall occurs during the growing season. Drought conditions are only occasionally of pronounced severity or length.

Original Vegetative Cover

The area is within the vegetative area described by Gordon[2] as the Northern Swamps Forest. No doubt, remnants of the Beech Forest Area also extend into this area. Principal forest trees in the original forest consisted of oak, hickory, beech, ash and sugar maple. Native shrubs consisted of dogwood, red bud, spice bush and prickly ash. Almost the entire area was forested with the exception of Blue River Valley through Prairie Township. Prairie Township received its name from that section which produced native grasses and marsh plants and only scattered trees. It was too wet for agricultural use until drainage was accomplished in 1898-1899.

---

[2]Gordon, Robert B. 1936. A Preliminary Vegetation Map of Indiana. Reprinted from "The American Midland Naturalist". Vol. 17, No. 5, pp 866-877, September 1936.

A good idea of the original cover can be obtained from the notes of the original government survey party which surveyed the area in 1821. A map on page 139 shows the original cover as determined by the kinds of trees found and marked at section corners or on section lines. Observation indicates that the type of cover was closely correlated with natural drainage conditions. John Hendricks[3] described the southeastern part of the area on May 18, 1821, when he said, "This township has a number of quagmires and small willow swamps which are generally hedged in with very close underwood; many of the small streams will fail in dry weather."

It is interesting to note that about this time he located, "A spring branch course west, fine water". And in another place after locating a section corner he recorded in his notes, "A cabin and small improvements in view northeast of corner". This is the only habitation recorded within the project area at the time of the original survey. The influence of 120 years of agricultural use in respect to these local landmarks is evident (figs. 3 and 4).

Wildlife

Speaking of Indiana in general Esarey[4] says, "The pioneers as a rule came to their western homes empty handed. While raising their first crops they lived on game. Many of them made their first payment for their land with money obtained from the pelts and venison hams. In their hunting they depended on dogs, traps, and flint-lock rifles."

---

[3]Hendricks, John. Certified copy of report of original survey available in Henry County Surveyor's office. New Castle, Indiana.

[4]Esarey, Logan. 1918. History of Indiana. Two volumes.



Figure 3. From this position and looking in this direction, the original land survey party recorded the only habitation and improvement in the project area in 1818.





Figure 4. This was a running spring branch in 1820, according to the records of the original land survey. It has been dry for over 40 years.



Lyon[5] indicates that the following mammals were probably present in Henry County at the time of early settlement: black bear, red fox, wolf, panther, wild cat, porcupine, rabbits, deer, and several kinds of squirrels, and other small non-game animals. In 1936, game animals and important rodents were limited to the ground hogs, rabbits, squirrels, skunk, opossum, raccoon and red fox.

Game birds consisting of wild turkeys and pigeons formerly reported as plentiful were extinct in 1936 and in their place were quail, hungarian partridge and ring-necked pheasants.

AGRICULTURAL HISTORY

Indian Occupation

The Delaware Indians had possession of the land previous to the occupation of white settlers. They had been pushed westward ahead of the Iroquoi who were their superiors in number and warfare.

Quoting Isaac McCory, a Baptist missionary, who visited the Delaware tribe in 1818 Esarey says, "Most of the Delaware at this time lived in log huts, had cleared land, and had planted some fruit trees." He refers to them as "living in squalor and debauchery because of the too frequent use of liquor".

---

[5] Lyon, Marcus Ward, Jr. 1936. Mammals of Indiana. Reprinted from "The American Midland Naturalist". Vol. 17, No. 1, pp 1-384. January 1936.

Settlement

Squatters began settlement in 1820, but the land was not authorized for sale by the government until 1822. The Richmond, Indiana Ledger, October 22, 1825, said the tide of immigration had never before set so hard toward Indianapolis and the west. For days the main street had been thronged with persons moving west, principally from the Ohio Valley. They appeared to be thrifty and well-to-do, directing large flocks of sheep and horned cattle. Land sold in Henry County at the government land office for $1.25 per acre.

The settlers came in rapidly, and in 1860 there were 1,052 inhabitants in Stony Creek Township, which is contained entirely within the project and typically represents 40 percent of the area. Of this number 789 were classed as rural inhabitants. Most of the settlers came from the eastern and southern states. The birthplaces of heads of families in Stony Creek Township in 1860, in order of importance, are: Indiana 53, Ohio 43, Virginia 22, North Carolina 19, Pennsylvania 14, Tennessee 8, Kentucky 7, New York 7, Maryland 5, Vermont 1, Delaware 1, England 1.

Early Agriculture

The fact that the settlers were largely unfavorable to slavery influenced the size of the farm unit and to some extent the crops produced. The average size of the farm unit in Stony Creek Township in 1860 was about 123 acres, and in 1940 was probably between 80 and 100 acres.

Early history indicates the farm incomes were largely dependent on animal products. Hogs have always been an important, if not the most important single source of income. Hogs were marketed first on foot in Cincinnati, Ohio, later by Whitewater Canal in Madison, Indiana, and still later by train or truck in Indianapolis. Because of the importance of hogs, corn has become the chief grain crop. A comparison of the livestock on farms in 1860 in Stony Creek Township with those on hand in 1940 is shown in table 1.

Concerning the clearing of the land Esarey says, "If the settlers had time, the easiest way to clear his land was to 'deaden' the trees in July or August, let them stand two years before clearing. Many would burn the trees as they stood. Such deadenings were to be seen on almost every farm."

Esarey also says, "Where there was no extraordinary rush, the land was not cleared immediately. The intended field was laid off and timber selected for fencing. The first choice for timber for fencing was walnut and poplar, though oak would be used rather than haul rails for as much as 1/4 mile." The need for conservation of natural resources was noted in 1874 when "The Peoples Guide of Henry County" reported, "Timber of the county is of fine quality consisting of maple, walnut, poplar, oak. From the first settling of the county up to the present time there has been much waste of timber but there is still enough, if taken care of, to last the county for a great many years for necessary repairs." However, timber land has not come to be recognized for its real worth. Much timber land has been pastured for many years and some has recently been cleared for cultivated crops.

Table 1. Average number of animals on farms in 1860 and 1936[1]

Number of Farms	(head) Hogs	Dairy Cows	Beef Cows	Other Cattle	Horses	Sheep	Oxen
87 farms 1936	62.0	7.7	4.3	--	2.8	12.5	0
Stony Creek Twp. farm 1860	19.8	2.9	--	2	4.4	12.5	0.4

[1]These figures represent average number of animals on hand at any given time, not the total number for the year or number marketed.

Mr. Frank Sorwash now operates a small saw mill in Mt. Summit which saws about 150,000 board feet of lumber each year. He came to Mt. Summit about 1897 and was employed for 12 years by the Ice Lumber Company, which was engaged in sawing and shipping lumber. At that time the company felt that most of the good timber had been cut and about 1910 they sold the mill to Mr. Sorwash. He continued to operate it for a number of years and shipped from 10 to 12 carloads of lumber each year in addition to the large quantities of framing material and lumber produced for the construction of local barns and covered bridges. Although most of the timber has been cut he says he is able to buy what timber he needs for his business locally.

He says he removed all the trees large enough for railroad ties from a woods 1 mile east of Mt. Summit in 1902. The timber consisted almost entirely of oak at that time. Some merchantable timber is available in this pastured woodlot now but the trees consist, almost entirely, of sugar maple and ash.

Early settlers were inclined to build their houses near springs of water and to clear the rough and better drained land first.

It appears that it was a common practice to plant the newly cleared fields to corn for a period of from 2 to 3 years before production of other crops such as wheat, oats, or hay was attempted. Gradually a system of crop rotation was begun which included corn, oats, wheat and hay. By 1936 many farmers had abandoned oats, and some had substituted soybeans. The most common rotation consisted of corn, wheat and hay. The plowing of the land once in 3 years has not allowed the maintenance of soil organic matter, particularly since meadow stands in the last 10 years have been generally unsatisfactory. Water absorption has decreased and run-off and erosion have apparently increased.

Early tillage methods were obviously poor and inefficient. In 1860, according to census reports, the value of tools on each farm in Stony Creek Township was only 2.8 percent of the total farm investment as compared with 6.1 percent invested on 87 farms included in an economic survey in 1936. Labor requirements for operating a farm, however, were much higher in 1860 than they were in 1936.

Those who owned hill and bottom land usually gave no thought to a division of land-use based on soil type or slope. There are known instances where fields were planned to contain both upland and bottom land and cultivation deliberately conducted up and down the slope. The purpose of such operations was to improve the so-called "chaffy" black ground by the addition of soil eroded from the upland soils. This practice was responsible for some very severe erosion.

Average crop yields reported for Stony Creek Township in 1860 were as follows: 12-15 bushels of wheat per acre, 40-45 bushels of corn per acre, 35 bushels of oats per acre, and 1½ to 2 tons of hay per acre.

Population Trend

Trend of rural population in Stony Creek Township since 1860:

Year	Population
1860	789
1870	---
1880	947
1890	1118
1900	962
1910	680
1920	626
1930	571

The gradual downward trend of population since 1890 in Stony Creek Township is representative of the area and this part of the state in general. It may be accounted for by the decrease in the size of the rural family and also by the fact that there has been a continuous movement of rural people into industrial cities. The latter was made possible through the use of labor saving machinery on the farm and general improvements in farm practices which made agriculture more efficient from a labor standpoint. During the last 10 to 15 years there has been an increasing number of rural people who actually derive their living from the city but continue to live in rural areas and are consequently classed as part of the rural population. Some of these people operate farms on a part-time basis, while others merely live on the farm with relatives and are not agricultural producers.

Land Tenure

There are no known statistics available regarding land tenure during the earlier periods. An analysis of the farm units in the project area in 1938 indicated that land ownership could be divided into six classes.

Ownership and Management in 1938

1.	Owner operated, full time farmer	41.0 percent
2.	Rented or other system of joint management, owner depends on farm as an important source of income	35.0 "
3.	Owner does not depend on farm for income, doctor, lawyer, business, etc., may or may not live on the farm	10.9 "
4.	Owned by industrial worker who lives on the farm and may operate it	7.6 "
5.	Owned by institutions, banks, insurance companies, etc.	4.6 "
6.	Towns, cemeteries, etc.	0.9 "
		100.0 "

There seems to be a general lack of regard for the land where the ownership or ownership and operation is divided. It is frequently pointed out by owner-operators that the most depleted and frequently the most severely eroded farms in their community are rented farms. The constant increasing importance of industry in the community had apparently encouraged poor land management practices. Industrial workers like to live on farms for three reasons: (1) To avoid the high cost of living in town; (2) have a place to keep the children busy; and (3) to have a means of support in case their regular work fails. The last two reasons frequently result in poor farm practices and soil waste largely because of poor planning and a hit or miss type of rotation.

Social Structure

Native-born Americans make up the present social structure. There has been no influx of foreign-born people. During the last 20 years industries have demanded increased labor which has been supplied partly by the local rural families, whose workers commute daily from country to town. Laborers have also emigrated from Tennessee and Kentucky. These out-of-state families are now becoming an important part of the local rural community.

Agricultural Industries

Agricultural industries have constantly decreased as transportation aided the cities in performing the work previously done in small communities. Agricultural industries recorded in Stony Creek Township in 1860 have almost entirely disappeared. At that time five men were employed as blacksmiths, three in saw mills, nine as woodworkers, six as shoemakers, one as a tanner, and one as a miller. Present agricultural industries in Stony Creek Township are concerned with the marketing of livestock through a railway stockyard; there is also a grain elevator and feed mill.

Probably not more than four full-time employees now work in these industries. The canning industry has increased in importance, and to some extent influences the agriculture in the project area. A canning factory handling vegetables is in operation at Mt. Summit in Prairie Township.

Agricultural Pattern

The present agricultural pattern is a result of factors heretofore discussed together with such factors as markets, credits and transportation. Gradual changes in the agricultural pattern are likely but a radical departure is probably not to be expected unless those who farm the land see the need for change based upon an improved or sustained income.

The project area lies within what is now known as the Central Grain and Livestock Area (fig. 5) and has been described by Purdue University Extension Service[6] in part, as follows: "General livestock farming predominates in this area with hogs occupying an important part. In general this area just about uses the feed crops produced. Wheat is the principal cash grain crop. Much of the clover and timothy acreage is used as rotation pasture and relatively little hay is made. Most of the soybean grain and seed acreage in the state lies in this area.

"Hogs constitute the most important livestock enterprise. In general, sufficient cattle are kept to utilize the available roughage and such grain feed as is required to go with it. The remainder of the feed grain except that required for work stock and the farm poultry flock is fed to hogs.

"In the eastern part of the area more milk cows and poultry are kept per square mile and per farm than elsewhere in the area. This is due in part to the favorable market outlet, and in part to the relative abundance of farm labor. Small farms and a dense farm population are also partly responsible for the development of an extensive canning crop industry. These crops, principally tomatoes and sweet corn have heavy seasonal labor requirements."

---

[6]Robertson, Lynn, Young, E. C., Houk, H. J. 1939. Types of Farming in Indiana. Purdue University Agricultural Experiment Station, Bulletin No. 342, Revised.

REGION 3 INDIANA

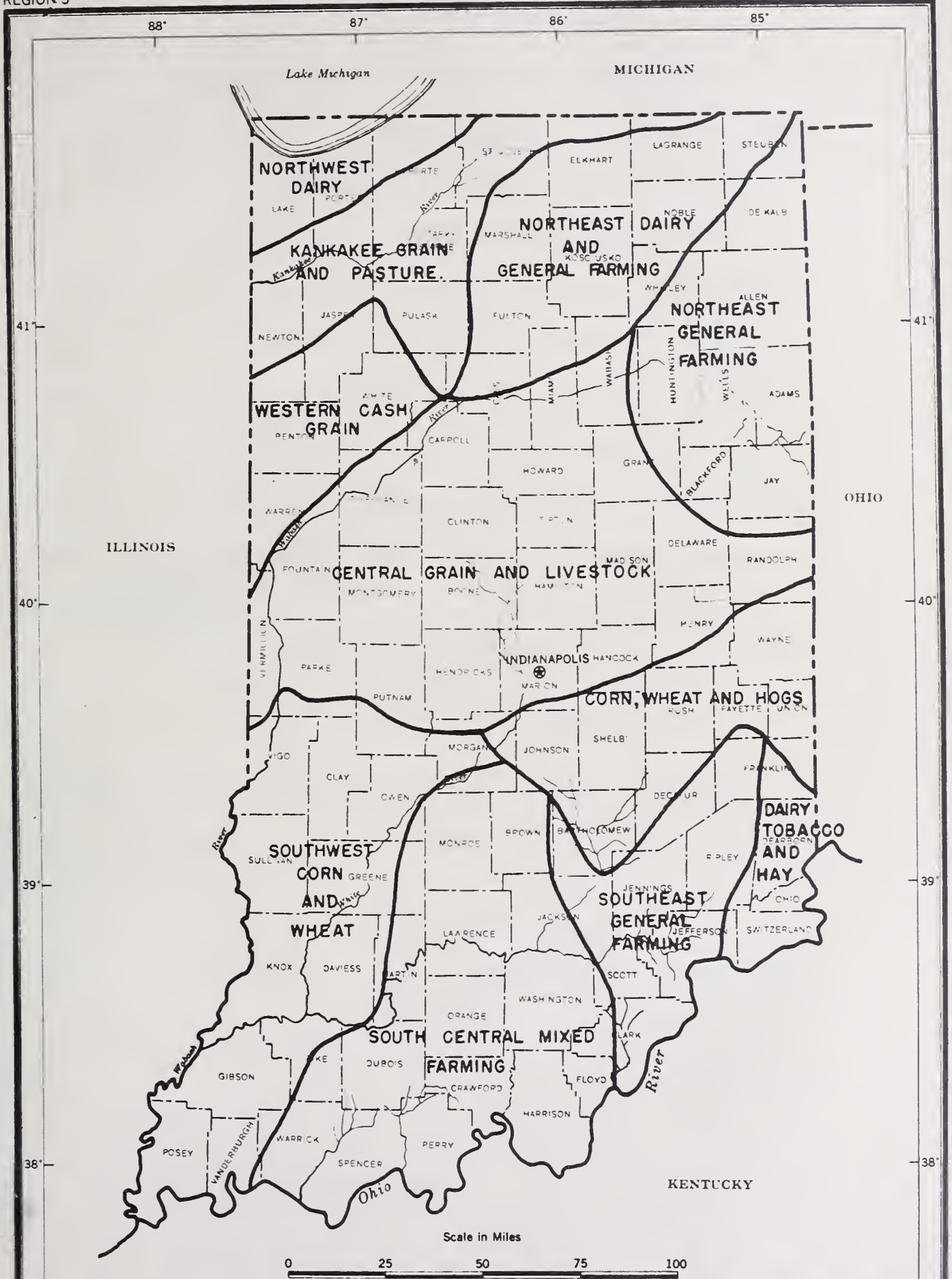


FIGURE 5. TYPES OF FARMING AREAS IN INDIANA.

UNITED STATES DEPARTMENT OF AGRICULTURE CARTOGRAPHIC DIVISION SOIL CONSERVATION SERVICE

From Bulletin 342 (Revised) Purdue University.

In order to furnish feed for livestock on farms a rather definite use of the land has developed. Corn has become the most important single crop in a livestock system, where hogs provide 39 percent of the gross income. Figure 6 shows the percent of various kinds of crops produced on cultivated land in 1936 on 48 farms which were later replanned for erosion control. This emphasizes that corn has become a very important crop, as it occupied nearly all of the 57.8 percent of crop land in clean-tilled crops. In addition to corn this group included only truck crops, such as tomatoes for a local cannery, and truck crops were relatively unimportant.

THE CONSERVATION SURVEY

When the project went into operation in the fall of 1936 the first concern was to take a physical inventory of the land.

Factors Considered

In order to arrive at the value of the land from the standpoint of long-time production, four physical factors were considered:

1. The kind of soil.
2. The percentage of slope.
3. The kind and amount of erosion.
4. The kind of land use, cultivation, pasture, woodland.

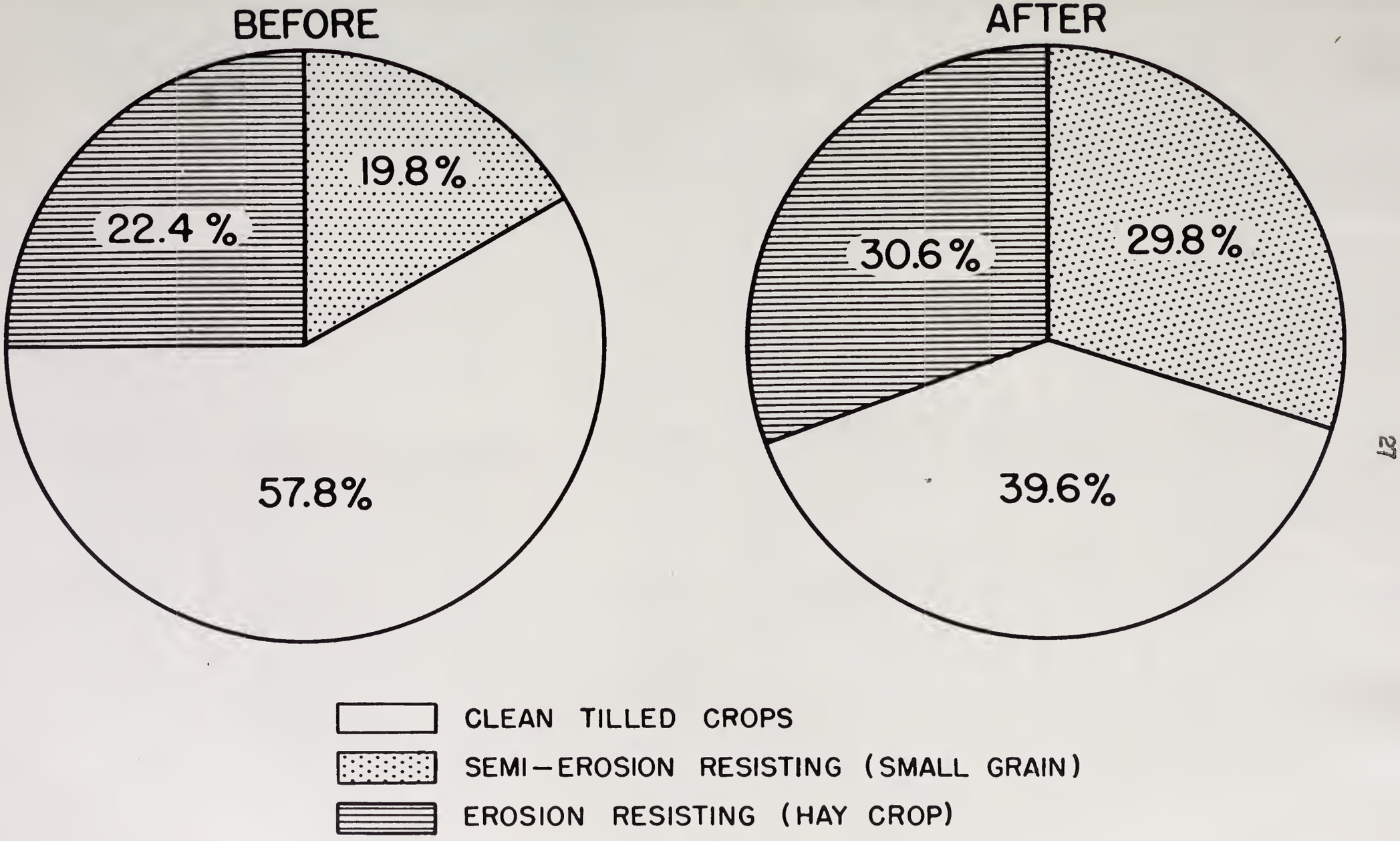


FIGURE 6.

RELATION OF CROPS BEFORE AND AFTER PLANNING FOR SOIL CONSERVATION.

How Conducted

The base maps used for this field survey were aerial photographs on a scale of 8 inches to the mile. Work began on this survey in October 1936 and was completed in September 1937.

The photographs were taken to the various farms and a thorough investigation of the land was made and each of the four factors were delineated or located on the photograph.

The erosion condition, slope and soil types were recorded on the photograph by the use of symbols and were always recorded in the same order. For example, the symbols, 33-10K-4 indicates 60 to 75 percent of the topsoil removed by erosion - 10 percent slope, hummocky topography - Miami silt loam soil. The cover symbols were so located on the photograph as to apply to entire fields. Legends used in making the conservation survey maps are found on pages 141, 142, and 143.

Soils

Although all the soil in the area was formed from the same general type of parent material several very different kinds of soil developed depending on drainage, slope and the plants which grew in the soil while it was in the process of formation. These various kinds of soils have certain more or less definite characteristics which can be recognized and classified. As a result of such classification soil names have been derived to fit soils of certain character and to set them apart from other soils.

When similar characteristics, such as number and thickness of horizons, texture (except surface texture), parent material, and associate features are found to be similar the unit of classification is called soil series. A soil type is distinguished from other soils of the same series on the basis of surface texture. The soil type is the unit used for detailed field mapping.

Slope

The slope of the land was determined by the use of an Abney hand level. The percentage of slope is read directly from the scale on the instrument. If there is a difference of 5 feet in elevation between two points 100 feet apart on a uniform slope, the percent of the slope is 5.

Since slope has an important relationship to run-off and erosion, and also to tillage practices, four slope classifications were established and defined. The slope classifications were designated by symbols in the form of capital letters and were known as A, B, C and D slopes[7], varying from 0 to 20 percent or more. A definition of the various slope classifications is, as follows:

A - 0-3 percent slope -- Comparatively level areas upon which there will be a minimum of erosion under normal conditions of tillage.

---

[7]Procedure for Making Soil Conservation Surveys. United States Department of Agriculture. Soil Conservation Service.

B - 3-10 percent slope -- That range of slope above the A group upon which under prevailing conditions of use, erosion is active on areas in cultivation but on which effective control measures can be established and still permit the growing of clean-tilled crops.

C - 10-20 percent slope -- Slopes on which clean-tilled crops should not be grown but which may be used for legumes, pasture, and other close-growing crops, if planted to provide cover throughout the year.

D - 20 percent and more slope -- Slopes which are too steep to permit effective erosion control if in cultivation.

Erosion

Two kinds of water erosion were delineated in the conservation survey, sheet and gully erosion. Sheet erosion is the removal of a more or less uniform layer of soil material by water action. Gully erosion is the formation of definite waterways or channels that are not obliterated by normal tillage operations. The various stages or classes of sheet and gully erosion are defined in the conservation survey legend, page .

The amount of sheet erosion or soil loss which had already taken place on a given soil was determined by comparing the depth of topsoil or subsoil with the average for that particular soil type under similar conditions where erosion had not occurred. Such un-eroded areas were found in woodland and along fence rows.

Cover

The cover or land use symbols used in the conservation survey give a permanent record of the vegetative cover for the year in which the survey was made. A summary of all the land in the various classes gives an accurate account of the land use, i.e., cultivated, pasture, woodland.

Class F woodland includes land with 40 percent or more of the ground covered by shade of trees of any age. Areas with less than 40 percent of the ground shaded were mapped as pasture or idle.

Findings of the Land Inventory and Related Observations

Soils.

Eighteen soils which are economically important for crop production were identified and located in the area. Figure 2, page 8, gives the general location of most of these soils in relation to the topography of the area. Table 2 shows all the soils identified and the percent of the area occupied by each of these soils.

Table 2. Relative importance of various soils in the Blountsville area[1]

Soil Number	Soil Types	Acreage	Percent of Total
4	Miami silt loam	4,094.9	46.16
2	Crosby silt loam	1,110.0	12.51
8	Brookston silty clay loam	989.8	11.27
5	Bellefontaine silt loam	865.1	9.75
29	Abington silty clay loam	615.6	6.90
40	Muck	340.7	3.84
6	Washtenaw silt loam	325.2	3.66
34	Genesee silt loam	167.3	1.88
28	Westland silty clay loam	133.7	1.50
33	Eel silt loam	89.6	1.01
25	Fox silt loam	82.0	0.92
41	Walkill silt loam	20.7	0.23
7	Washtenaw silt loam, poorly drained phase	14.1	0.15
1	Warners silt loam	9.6	0.11
23	Fox loam	5.7	0.06
22	Homer silt loam	4.5	0.05
24	Fox silt loam, deep phase[2]	0.0	0.00
	Total	8,868.5	100.0

[1]Obtained from an analysis of 8,868.5 acres, representative of the project area.

[2]No Fox silt loam, deep phase, present in the portion summarized. There is only a very small acreage in the entire project area.

The most important soil type, Miami silt loam, is commonly known to landowners as sugar tree land. It is a brown upland, well-drained soil with a reddish brown subsoil. Two other soils that often occur in the same field with sugar tree land are Crosby and Brookston silt loams. Crosby is a light-colored, poorly-drained soil sometimes called beech tree land. This land is almost level but lies slightly higher than the dark-colored Brookston. The Brookston frequently requires drainage and may have produced swamp-type trees and shrubs before being cleared for cultivation.

Near the main drainage courses Bellefontaine silt loam is often an important soil type. It is similar to Miami in appearance but it usually has more slope and is always underlaid with gravel.

Between the valley walls and the main drainage course are terrace soils. They are, usually, almost level and productive. The well-drained light-colored type, called Fox silt loam, is similar to Miami in appearance but it is usually more level and is underlaid with gravel. It may be droughty in a dry season. Westland and Abington silt loams are poorly-drained terrace soils. They are dark-colored and are often used for corn rather consistently. They occur in what was known as the Prairie. Muck is chaffy and black and is made of decayed vegetable matter. Genesee and Eel are light-colored productive river bottom soils. They usually require no lime for successful production of legumes.

Walkill and Washtenaw are overwash caused by soil material being deposited on other soil because of erosion from land lying above.

Warners is a marl or lime mixed with soil impurities. It is found along the valley walls and is not very productive. It is valuable, however, as a soil amendment for use on soil requiring lime. Some of the material in the project area is over 90 percent calcium carbonate.

The depth of topsoil on the upland series where no erosion had occurred was about 12 inches. This was remarkably uniform for most of the area with the exception of steep slopes where approximately 8 inches of topsoil was found under un-eroded conditions. The light-colored terrace soils had a normal topsoil of 12 inches, except where gravel was close to the surface and a rather shallow profile developed resulting in topsoil only 6 inches to 8 inches thick. The dark valley soils had no well defined topsoil layer and conditions were such that accelerated erosion was difficult to measure.

Slope.

Soil loss is usually closely correlated with the slope but it is also dependent on the number of years of cultivation. See table 3. For example, there is a field of Bellefontaine soil near the west side of the area which was cleared of timber about 60 years ago. The present owner was a small boy at that time. He believes that not more than one or two crops of corn was produced followed by small grain. The field was then converted to pasture and has never been plowed since that time. Slopes exceeding 40 percent have been measured in this field, yet the present pasture cover is average or above for the area and there is little evidence that serious erosion has occurred.

In contrast to this field there are other fields of the same soil type but with slightly less slope which have been used continuously for cultivated crops since they were cleared of timber. A number of these fields now have small areas ranging from a few square yards up to half an acre or more where both the topsoil and the subsoil have been removed by erosion. This represents the loss of about 3 feet of soil material. A comparison of the two conditions described illustrates that permanent bluegrass pasture, properly managed, is a good erosion control crop for soils with considerable slope. In this respect, it is similar to the native unpastured woodland which originally protected the soil and to a large extent controlled water run-off. Some bluegrass pastures control erosion more effectively than others, depending upon the quality of the cover. Figure 7 shows some relationships between slope, erosion and cover.

Table 3. Relation of slope to soil loss

Slope	Slight erosion		Moderate erosion		Severe erosion		Very severe erosion		Total Acres	Percent of area
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent		
A - 0-3%	3033.9	98.43	46.3	1.5	0	0	2.1	0.07	3082.3	35.4
B - 3-10%	973.8	24.37	1948.0	48.74	918.0	22.97	156.7	3.92	3996.5	47.1
C - 10-20%	60.7	5.33	112.2	9.85	293.0	25.71	673.6	59.11	1139.5	13.5
D - 20% +	27.8	7.43	22.7	6.06	55.7	14.88	268.1	71.63	374.3	4.0



Figure 7. Twenty-five years ago there was a fence on the line between A and B. The field in the foreground had been in cultivation for 50 years or more. The field beyond the fence line was cleared about 28 years ago and produced two or three cultivated crops. Both fields were then converted to pasture land and have been subject to the same management. The severely eroded area in the foreground produced very poor pasture in 1937 as compared to the un-eroded area in the background.

The shift to pasture on the steeper slopes along the valleys was accomplished during a period of 10 or 20 years following 1900. Blue River was adequately dredged at about this time and cultivation was shifted to the valley. Owners who had made this shift were reluctant to plow the steeper areas even during the period of the World War. As tractors began to come into general use, tillage operations were extended by renting other land less subject to erosion, and fields which had recently been converted to pasture were thus left in sod. This was usually not because of any desire to conserve the soil by maintaining it in permanent cover, but it was more likely the result of recognizing the soils on the steep slopes as less productive than the more level soils. There was also the increased difficulty of cultivating the steeper slopes with power machinery. Tractor manufacturers recognized this difficulty as indicated by one of them in advertising his product in the Indiana Farmers Guide, February 10, 1940, in which he said,

"Even a boy can operate it under many conditions where man and horses work only with the greatest difficulty.....There are steep hills where no tractor has ever been, but boys will plow and cultivate them without fear."

Most of the active gullies found in 1936 were in pasture land occupying steep slopes which had formerly been in cultivation. In several cases the owners related how they had formerly cultivated over the drainage courses and that no gullies appeared until about the time, or some time after, the field was converted to pasture (fig. 8). In such cases it was obvious that the removal of plant food through crop production and attendant soil loss had depleted the soil on the slope to the extent that a good bluegrass cover could not be obtained. Because of a poor sod and a pasture management system which allowed frequent untimely grazing, the cover was unable to hold back or absorb the normal rainfall. Concentration of run-off in the drainage courses resulted in gullying. The soil loss from such fields was usually traced directly to the river bottom fields which were adjacent to them, and frequently on the same farm. An example of this combination of erosion and deposition, in which 29 acres of Genesee, Abington and Westland soils had received up to 16 inches of recent fill from about 100 acres of hill land on two farms was observed. In another instance 7 acres of Abington received up to 3 feet of soil and parent material from a drainage area on the same farm. A man-made ditch to carry water run-off contributed to this condition. The latter example indicates that soil productivity in the river bottom has in some cases been decreased considerably because of erosion on nearby uplands.



Figure 8. This gully which averaged about 5 feet deep and which had a total length of about 80 rods developed in this pasture field following a period of cultivation which ended about 1910. Material eroded from this gully was deposited on dark river bottom soil about a half-mile away and on another farm.



Erosion.

Up to the present time the soil loss which has occurred on cultivated land has not been spectacular. Soil eroded from the steepest part of the field has usually lodged in the slight depressions and has not been entirely removed from the farm. Landowners who recognized soil loss apparently felt that it was a normal result of cultivation and that little or nothing could be done about it.

The gradual removal of plant nutrients and calcium by crops from soils which were but slightly affected by erosion, made it difficult to obtain satisfactory stands of legumes, and failure to secure satisfactory stands of legumes on upland soils resulted in a marked decrease in soil organic matter. As a result of this the soils became more compact and less absorbent. This loss of organic matter also apparently decreased yields of the other common crops.

The steepest parts of the fields, or areas most subject to erosion, received most of the manure and therefore frequently produced legume stands equal or superior to those on un-eroded portions of the same field. Where erosion had progressed far enough, so that the highly calcareous parent material was exposed, or within easy reach of the plant roots, the stand of legumes was almost always superior to that on any other part of the field (fig. 9). On the other hand if the entire field had received enough lime to produce a good stand of legumes the most severely eroded areas would produce less growth than the balance of the field because of poor moisture conditions and lack of plant nutrients.



Figure 9. Sweet clover seeded on this un-limed field of Miami silt loam in 1937 produced an excellent stand on the most severely eroded slopes, as indicated by this picture taken in October of that year. Un-eroded areas in the same field failed to produce a satisfactory stand.



Nevertheless, few farmers made use of lime. The county agricultural agent expressed this fact very well when he said that "The use of lime was common knowledge but not a common practice". In cases where erosion had exposed or nearly exposed the parent material, and where lime had not been applied on the balance of the field, the eroded areas seemed to produce comparatively good crops. Successful stands of legumes on severely eroded areas were misleading to the farmers. Even under conditions of severe erosion, corn has been known to produce fairly good yields if well supplied with moisture and plant foods throughout the season. Some landowners indicate that they believe they could produce as good corn on these areas as they formerly did providing they could get a good stand, and had plenty of moisture. This usually resolved itself into a matter of blaming the weather rather than recognizing soil loss as detrimental. Results obtained in a special study of yield of corn on Miami silt loam under various degrees of erosion are discussed on page .

The 10-year average crop yields for some of the principal crops in 1936 was as follows: 40 bushels of corn per acre, 17 bushels of wheat per acre, 29 bushels of oats per acre, 16 bushels of soybeans per acre, 13 bushels of rye per acre and 1.4 tons of hay per acre.

Row crops had always been grown in straight rows. There was little inclination to divide similar slopes and similar soils into separate fields, except along the valleys. Square-cornered fields was the rule wherever possible. Bottom land was frequently separated from upland, but this did not require or anticipate the separation of the dark Westland and Abington soils from the light-colored Fox, Genesee and Eel.

Within farms on the comparatively level upland, there was little or no attempt to use the erosion susceptible slopes for longer rotations than would be used ordinarily on the most level areas on the same farm. (A longer rotation in this case means a rotation from 4 to 8 years in length which would include 1 year of row crops, 1 year of small grain, and the balance of the rotation as a legume-grass mixture for hay or pasture.)

Cover.

The land inventory recorded how the land was being used or what kind of crop cover occupied the land at the time of the survey. It also shows how the farmer had chosen land for various uses as these uses were related to slope.

Table 4 shows that there was a decided tendency to use the most level land for cultivation.

Table 4. Land uses

Slope class		Percent of land in each class used for:					
Symbol	Percent	Cultivation	Pasture	Woodland	Misc.	Idle	Total
A	0-3	77.4	12.4	8.4	1.3	0.5	100
B	3-10	60.7	24.4	10.6	4.2	0.1	100
C	10-20	43.5	42.9	8.8	4.2	0.6	100
D	20 & up	23.4	62.1	11.5	2.4	0.6	100
Percent of land in each kind of use for entire area		62.9	24.1	9.5	3.1	0.4	100

Only 23.4 percent of the D slope land was being used regularly for cultivated crops in 1936-37. This would amount to about 87 acres for the entire project area. On the other hand it will be noted that there was a decided tendency to use the land with steepest slopes for pasture. In the case of C slopes (from 10 to 20 percent) about as much was used for cultivation as for pasture. There appears to have been no particular choice in regard to slope for woodland because approximately the same percent of each slope class was devoted to this use.

Table 4 shows that almost two-thirds of all the land was used for crops, about one-fourth for pasture and about one-tenth for woodland. Woodland in this case includes all land where 40 percent of the ground was covered with shade regardless of the size of the trees and whether or not the area was pastured.

Woodland which has been only slightly pastured or not pastured at all had suffered the least from soil loss. Where the leaf litter had not been disturbed the soil had retained its ability to absorb water rapidly and transport it to lower levels. Destruction of this protective cover and trampling by grazing animals had encouraged water run-off and soil loss. Less than 5 percent of the land in the area, most of which was originally in timber, was found to be protected woodland in 1937-1938. All other woodland, about 4.5 percent of the area, was grazed woodland and consequently subject to considerable soil and water loss.

The condition of the land with respect to erosion and the cover or use is shown in table 5. The fact that pasture land showed the most severe erosion needs explanation. As indicated elsewhere the tendency of early settlers was to farm the best-drained, hence the steepest, land first. Most of this type of land was being used as pasture in 1936. Therefore, it was apparent that in many cases pasture land was in reality worn-out crop land.

It was readily determined from the results of the soil inventory that the prevailing system of agriculture was not preventing soil loss. However, the farm operators had not suffered much decrease in farm income because of erosion. There were several reasons for this. Improved crop varieties had come into common use. The most important example was hybrid corn varieties, which came into general use during the period 1930 to 1940. Increased use of fertilizer also assisted in maintaining crop yields. Almost all farmers used fertilizer on both wheat and corn. The extension program in general, had emphasized efficiency in production. This resulted not only in cheaper crop production, but also in cheaper and more efficient livestock production. This was particularly true with hogs which were the most important type of livestock in the area.

Table 5. Relation of cover to erosion

Kind of use in 1936	Percent of land in each kind of land use on which the erosion was:			
	Slight	Moderate	Severe	Very severe
Woodland	72.2	17.7	4.8	5.3
Cultivation	51.6	24.4	14.7	9.3
Pasture	29.3	29.0	18.5	23.2

With the improved knowledge of agricultural methods and more efficient means of production there seems to have been only one reason why crop yields were not being increased. The loss of the soil itself and the plant food which it contained had not been considered. Nevertheless, crop production continued during the early 1930's at a rate greater than consumption. This was as true for the project area as it was the county as a whole. The Agricultural Adjustment Administration assisted in maintaining farm income during this period. Some leaders in agriculture came to the conclusion that extensive farm operations not only decreased farm income but that it also frequently encouraged soil erosion.

An analysis of the conservation survey indicated that about one-third of the land could be safely tilled without the use of soil saving methods while another one-third required simple practices for erosion control. About one-eighth of the land was suitable for cultivation with complex erosion control practices and that the land remaining was not suitable for regular cultivation.

To sum up, from the foregoing observations, the following deductions were made:

1. Sheet erosion is the prevalent type of erosion in the Blountsville area.

2. Gully erosion, at present of minor importance, will become more evident if sheet erosion continues.

3. The production of corn and consequent clean cultivation is the principal cause of soil loss.

4. The organic matter content of the soil has been reduced by farm operations and has resulted in decreased water absorption by the soil.

5. Erosion on the uplands causes deposition on the valley soils.

THE ECONOMIC SURVEY

A farm management study was likewise one of the first tasks of the Service[8]. The purpose of the farm management study was three-fold: First, to determine the type of farming and the kind and amount of income before an erosion control program went into effect; second, to determine the factors which affect farm income and to appraise from the standpoint of farm management the erosion control methods advocated by the Soil Conservation Service; and third, to serve as basic information against which the results of recommended practices might be checked in future years.

Size of Farms

Since the size of the farm is an important consideration in the study of farm organization and land use, the 87 farms on which studies were made were divided into four groups in order to compare the farms of different sizes.

---

[8]Soil Conservation Service, Project Ind-2. 1937. A statistical analysis of 87 farms income survey records for year ending November 1, 1936, in New Castle, Indiana. (Unpublished report)

Table 6 shows how the farms were grouped. Group I includes farms from 241 acres to 320 acres in size, the 14 farms in this group averaging 282 acres. The farms in each group were divided into two classes, the high and the low income group. The seven high income farms in group I average 275 acres, while the seven low income farms average 290 acres. Although the size of the farm is an important factor, it does not always insure higher farm incomes, since in groups I and II the low income farms were slightly larger, while in groups III and IV, the high income farms are larger. Factors other than size of farm influence income.

Farm income as used here signifies receipts minus expenses, using depreciation and loss in inventory as expenses, and increases in inventory as receipts.

A charge of 5 percent on the investment was made against farm income to determine farm labor income. Products such as food and fuel derived from the farm, valued at farm prices were added to labor income to make Labor Earnings.

Farm Earnings

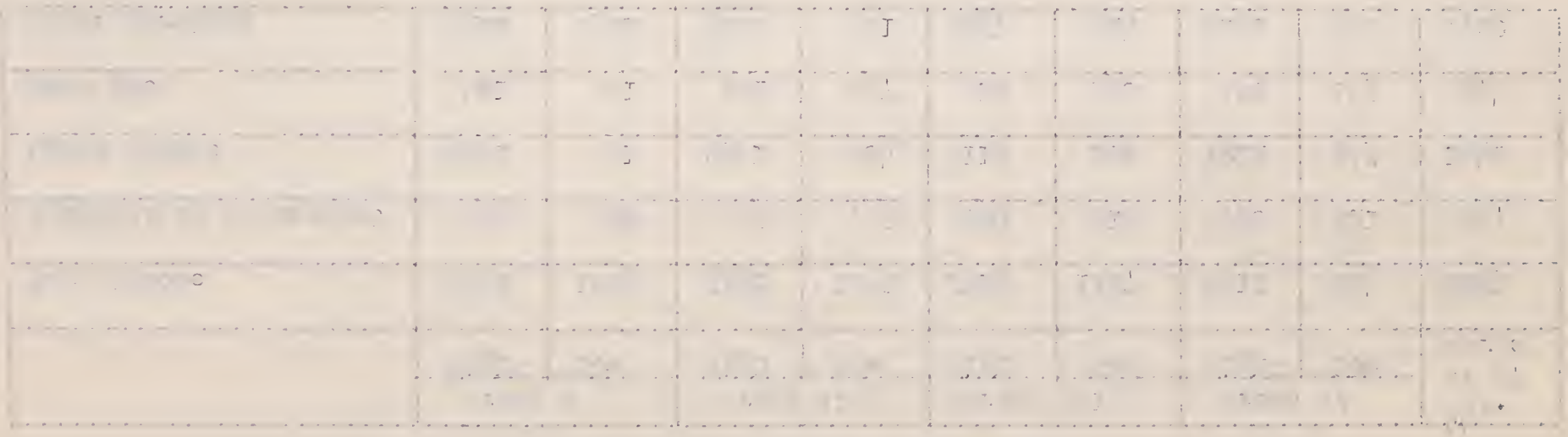
Table 7 shows how much the labor earnings varied between the high and low income farms within each of the four sized groups and from the average of all 87 farms. The average earnings of the high income farms in each group were above the average for all farms ($1720); while the average labor earnings in the low income farms in each and every group were below the average of all farms.

Table 6. Grouping of farms according to size

Group	Size range	No. of Farms	Ave. size of farms	High Income Farms		Low Income Farms	
				No. Farms	Ave. Size	No. Farms	Ave. Size
	acres		acres		acres		acres
I	320-241	14	282	7	275	7	290
II	240-161	20	188	10	187	10	190
III	160-81	33	131	16	135	17	127
IV	80-0	20	67	10	74	10	60

Table 7. Variations in earnings

	Group I		Group II		Group III		Group IV		Ave. of 87 farms
	High	Low	High	Low	High	Low	High	Low	
Farm income	3756	1880	3396	1155	2719	1187	2318	684	2053
Interest on Investment	895	939	655	780	600	519	396	321	607
Labor Income	2861	941	2741	364	2119	668	1922	363	1446
Home use	421	361	262	257	318	256	180	185	274
Labor Earnings	3282	1302	3008	621	2437	924	2102	548	1720



This shows that it is possible to earn a relatively high income on a small farm. Labor earnings for the average of the 10 high farms in group IV were $2102. Labor earnings for the low income farms in the large-size farms (1420) were below the high income farms in all groups as well as below the average of all farms.

Land Use

An analysis of land use on a percentage basis showed that all farms had 28 percent (27.3 acres corn and 0.7 acres silage) of all the land in the farm in corn. There was apparently no significant variation in the amount of corn per 100 acres in farms between the high and low income farms within any one group or between groups. There seemed to be no apparent wide variation in land use which could be pointed to as being a definite explanation of higher incomes. The high-income farms in all groups generally had more alfalfa hay than the low income farms and the average of all farms. The marked degree of uniformity of land use of farms of different sizes made it difficult to determine any outstanding explanation of high and low incomes.

Source of Income

Seventy-five and two-tenths percent of the income on all farms came from livestock products and livestock, 38.8 percent came from hogs, and 15.9 percent came from dairy products. On large farms the sale of crops was generally more important than on small farms. The larger farms derived a greater percent of income from hogs and beef cattle than did the smaller farms. On small farms, dairy products, eggs, and miscellaneous (usually in labor away from the farm) furnished a higher percentage of total income.

In planning a soil conservation program on farms, it would seem highly desirable, if not necessary, to go farther than merely classifying land for its best use. The finished plan might well recognize and deal with the entire farm organization of land, livestock, equipment and labor. It might be well to consider that the farm operator has all these factors to deal with and try to assist him in developing a soil and water conservation program with a minimum dis-arrangement of his established practices.

Livestock

That a heavy livestock type of farming is being followed is further shown by table 8, which shows that high-income farms, generally, had more animal units per 100 acres in the farm than did low-income farms. The small farms, or group IV is the one exception but here both the high and low groups had more livestock per 100 acres than the average of all farms, which was 21 animal units per 100 acres. It is interesting to note as one inspects this table, going from large to small farms how the density of horses increased; dairy cattle increased; beef cattle decreased; sheep decreased; hogs increased; and poultry increased.

Table 8. Animal units per 100 acres in farm

	Group I		Group II		Group III		Group IV		Average of 87 farms
	High	Low	High	Low	High	Low	High	Low	
Horses	2.0	1.5	1.5	1.4	2.1	2.0	3.2	2.7	2.1
Dairy cattle	2.7	2.7	5.2	2.7	7.6	4.9	11.1	11.2	5.6
Beef cattle	3.8	1.2	3.0	6.6	1.0	3.5	0.1	0.8	3.1
Sheep	1.1	0.4	1.2	1.7	0.4	2.0	0.1	0.0	1.2
Hogs	7.3	4.8	8.4	6.1	9.4	6.3	8.8	8.7	8.1
Poultry	0.6	0.6	0.7	0.4	1.0	1.2	1.4	1.5	0.9
Total	17.5	10.8	20.0	18.9	21.5	19.9	24.7	25.9	21.0



Pasture

The analysis showed that all farms provided a total of all kinds of pasture of 2 acres per animal unit, and that the larger farms made more intensive use of pasture than smaller farms. Two acres per animal unit may be regarded as low, especially since a part of it is woods. Bluegrass grows naturally and the carrying capacity of pasture, generally, in this area is good. Because of the density of livestock and the heavy use of pasture, it is probable that every soil conservation program should include pasture treatment and management.

Capital Invested

All farms had an average of $88.39 per acre invested. Of the total investment, $46.78 (52.9 percent) was in land; $26.28 (29.7 percent) was in buildings; $5.31 (6.1 percent) was in machinery; and $10.00 (11.3 percent) was in livestock, per acre.

Generally speaking, the small farms have a greater part of total investment in buildings and correspondingly less in directly productive enterprises as livestock, machinery and land, than have the larger farms.

The system of management applied to land may influence its future value. Good management should recognize the ultimate effect on the land as well as immediate income to the operator (Fig. 10).



Figure 10. According to local people, these buildings were in excellent repair about 1900. At that time most of the 60 acres of the land in the farm were used for pasture. The system of management employed by its subsequent owners had resulted in depreciation of both land and buildings. In 1937, one field of Crosby and Miami silt loam on this farm had been in corn for 7 consecutive years.



Efficiency of Operations

The average of all 87 farms had a gross income of $23 per acre, with a cash expense of $47 per $100 receipts. The average farm had a gross income of $3,486 on a $12,187 investment, which is $286 per $1000 invested. At that rate it would take 3.5 years to turn the investment. Further study of this table shows that there is less difference of efficiency between the size groups of farms than between the high and low income farms within any one size group.

In the foregoing pages, it was pointed out that variations in earnings could not be satisfactorily explained through excellence of any one factor such as size of farm, land use, type of farming, kind and amount of livestock, or capital invested.

Efficiency of operations appeared to depend on such factors as receipts per $1000 invested, expenses per $100 receipts, animal units per man, and crop acres per man and per horse. A combination of factors contribute to how a farm can be operated successfully. A broad term "better farm management" including a combination of all factors is largely responsible for high income.

Suggestions for improvement - Farm Management Standpoint

1. Cultivate best land most intensively but lengthen the crop rotation on less productive land.

2. Increase pasture acres per animal unit and practice pasture improvement through treatment and management.

3. More protected woods per farm from fire and grazing.

4. Balance crop and livestock production so as to furnish a larger part of total feed from pasture and hay for greater economy and better erosion control practices.

5. Adapt needed erosion control practices to maintain soil productivity and to insure a long time satisfactory income.

THE EROSION CONTROL PROGRAM OF THE SERVICE

Following the investigation work, a part of which has been described in the discussion of the soil and farm management surveys, a plan for controlling erosion on farms within the project area was prepared. This plan was known as the basic plan. Details regarding plans for the various classes of land may be obtained by referring to this report.

Basic Plan

The preparation of the basic plan required and made use of knowledge or experience of several interested agencies.

The Extension Service had assembled more information regarding agriculture in Henry County than any other agency. It was interested in helping to formulate a program which would fit the farm and the farmer. Shortly after the project was established, several meetings were held in cooperation with the Extension Service at which various types of erosion control measures were discussed in relation to other recommended agricultural practices. This exchange of ideas was a valuable contribution to the basic plan.

Cooperating Agencies

Other agencies interested in the conservation of the soil and water contributed in some way to the basic plan. They were: Farm Bureau, Farm Security Administration, Agricultural Adjustment Administration, Federal Land Bank, Bureau of Agricultural Economics, State Department of Conservation and local civic organizations.

The Service had the benefit of experience with a similar demonstration area near Bedford, Indiana. Part of the Blountsville project personnel had been at Bedford and was familiar with the usual soil and water conservation measures. Other personnel was obtained from similar projects outside the state or from the technical organization of several of the various Civilian Conservation Corps camps in Indiana which were engaged in soil and water conservation.

It should be noted that a vast amount of general information of a technical nature was available concerning good agricultural practices, but there had been little attempt to evaluate these practices from the standpoint of soil and water conservation. Examples could be cited as follows:

1. Pasture improvement was studied from the standpoint of increased forage.

2. The use of lime was recommended for the successful production of legumes.

3. Approved rotations were recognized as a means of improving crop yields.

4. Protection of woodland from grazing was recommended for satisfactory production of timber.

All of these practices and many more, if in common use, were assisting in the control of soil and water loss. The problem was to coordinate the various farm practices into a plan which would serve a dual purpose, maintain or improve farm income and decrease soil erosion. It was apparent that the farmer in an effort to improve or maintain his income was sometimes encouraged or forced to exploit and finally destroy the source of this income, the land.

Any one farm may contain several kinds of soil or conditions of slope, drainage, fertility, or erosion which require diversity of land use.

This land may be grouped into classes or assigned various capabilities. These classes or capabilities indicate the most intensive tillage that can be practiced safely with permanent maintenance of the soil. The findings regarding land capabilities are perhaps the most important result of the conservation and economic survey.

Land Use Capability

Five classes of land were recognized in the Blountsville project area. They are described briefly, as follows[9]:

---

[9]Soil Conservation Handbook, U.S.D.A. Miscellaneous Publication No. 352. August 1939.

Class I.

Land that, from the standpoint of inherent soil characteristics and environmental features, can be cultivated (such as is practiced with inter-tilled crops and in preparing the land for grain crops) permanently and safely with the production of moderate to high yields of adapted farm crops without special practices or measures.

Class II.

Land that, from the standpoint of inherent soil characteristics and environmental features, requires one or more special practices that are easily applied in order to be cultivated safely and permanently with the production of moderate to high yields of adapted farm crops.

Class III.

Land that, from the standpoint of inherent soil characteristics and environmental features, requires complex or intensive measures in order to be cultivated safely and permanently with the production of moderate to high yields of the adapted farm crops.

Class IV.

Land that, from the standpoint of inherent soil characteristics and environmental features, is not suitable for regular or continuous cultivation with the production of moderate to high yields of adapted crops but with adequate protection is suitable for uses that may involve short periods of cultivation.

Class V.

Land that, because of one or more inherent soil characteristic or environmental feature, is not suitable for cultivation. Most land of this class can be used best for woodland or wildlife purposes, or permanent pasture.

Land use capability tables are shown on pages 145 to 168.

The percent of land occurring in each of the various capability classes was as follows:

I	Suitable for cultvation without special practices	35.4
II	Suitable for cultivation with simple practices	33.4
III	Suitable for cultivation with complex or intensive practices	12.1
	Sub-total -- all land suitable for regular cropland	80.9
IV	Not suitable for continuous or regular cultivation	7.3
V	Not suitable for cultivation	11.8
	Total	100.0

Reference to Figure 11 shows that of all the land planned for erosion control, only about 60 percent was being used for cultivated crops prior to replanning.

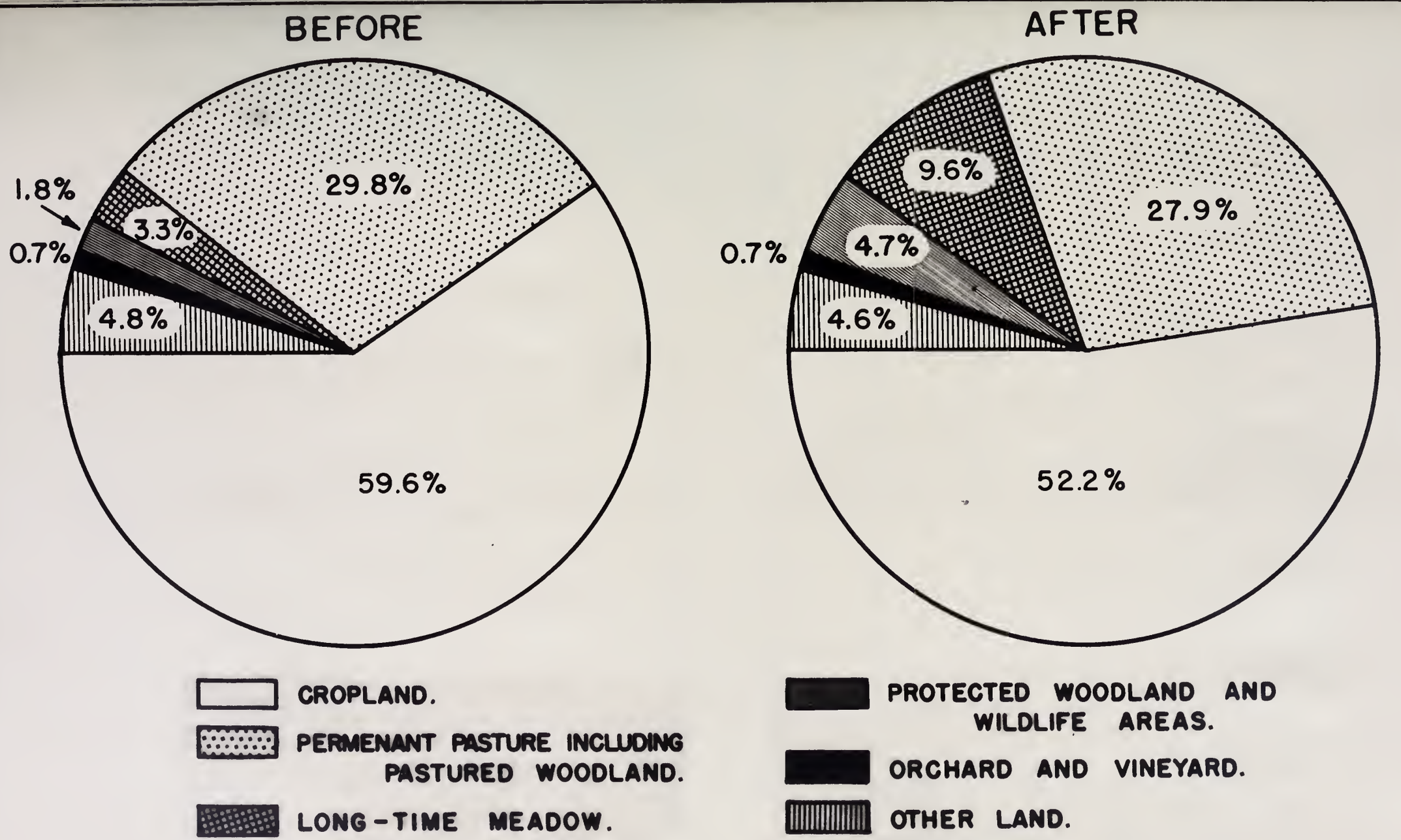


FIGURE 11.

LAND USE BEFORE AND AFTER PLANNING FOR SOIL CONSERVATION.

Land Use and Soil Conserving Measures

This, however, does not indicate that erosion control measures were unnecessary. The topography of the land was such that it had been considered impractical by farmers to make a change in land use as between capability class I or II and class IV or V and in such small areas that its separation from a land use standpoint was physically impossible. Erosion which occurred on the sloping areas of the field influenced class I and II land in two ways. If these classes lay above and adjacent to the steep areas they became increasingly more subject to erosion, as erosion occurred on the steeper slopes. On the other hand if they lay below and adjacent to the steeper slopes, they were subject to siltation or deposition.

In actual planning, therefore, class I or II land, where it existed in small areas, was of necessity placed in the same land use as class III, IV or V land.

Frequently class I land occurred in fairly large areas, as for instance, in upland fields consisting of Crosby and Brookston or in bottom fields consisting of Abington, Westland, Muck or Genesee. Since this class included both dark and light colored soils there was considerable variation in the rotations recommended. Continuous corn with a cover crop for green manure was considered satisfactory for such soils as Westland, Abington and Muck in certain cases, but it was generally agreed that a longer rotation was desirable. Longer rotations suggested consisted of a 2-year rotation of corn and wheat with sweet clover as a green manure crop, or a 3-year rotation consisting of corn, wheat, hay or pasture.

On the upland soils of class I land, continuous corn was not recommended. The longer rotations shown above were considered adequate on Brookston but a 3 or 4-year rotation which included 1 or 2 years of meadow was suggested for the light colored upland soils. It was expected that the rotations recommended would be used in connection with good farm practices which included:

1. The use of lime as needed.

2. Use of adapted legumes including alfalfa in mixture grasses for hay, rotation pasture, or green manure.

3. Animal consumption of all crops grown on the farm, including wheat, depending on the price.

4. Application of manure to young wheat during the winter or on old meadow preceding corn.

5. Fertilizer applications on wheat and corn, using heavier applications on wheat than on corn.

6. Return all crop residues to the soil.

Class II land was considered to require longer rotations in general than class I land. Suitable rotations consisted of a row crop, small grain, and 1 or 2 years of grass-legume mixture for hay or pasture. It was assumed that good farm practices would be followed as listed for class I land. In addition, special practices for erosion control were believed essential. These included the following where applicable.

1. Sod waterways.
2. Contour cultivation.
3. Contour seeding.
4. Diversion ditches.
5. Strip cropping.
6. Drainage.

These practices might be used singly or in a combination as conditions required.

Class III land where used as cropland was considered to require longer rotations generally than class II land. Some rotations considered suitable in order of priority were:

1. Small grain, meadow, meadow, meadow.
2. Soybeans, small grain, meadow, meadow.
3. Row crops, small grain, meadow, meadow.

In addition, all the special practices required for class II land were considered essential, either singly, or in combination. It was also assumed that good farm practices as outlined for class I land would also be followed.

Class IV land was considered suitable for long-time legume-grass meadow for hay or pasture. No row crops were recommended under any conditions. Small grain or 1 year or some close-growing crop, such as soybeans, followed by small grain was considered as a satisfactory method of establishing the long-time meadow.

Special practices and good farm practices as required for class III land were believed essential.

Permanent pasture properly managed and treated was also recommended for this classification.

Class V land was considered most useful for woodland, properly protected and managed, or permanent pasture.

Permanent pasture cover on steep slopes does not always prevent soil loss or provide satisfactory pasture. The reasons for this failure can often be traced to lack of soil fertility, through crop removal or erosion, or to improper grazing management or both (Fig. 7). Provision for treatment of such areas with lime and fertilizer and reseeding with adapted grasses and legumes and grazing management were recommended as a means of re-establishing such areas in a profitable and protective covering. The construction of contour furrows on Miami and Bellefontaine soils with 5 to 10 percent slopes and all degrees of erosion was a new practice recommended for the conservation of water on poor pastures where gully control was dependent on decreased run-off and could not be obtained immediately by pasture treatment.

Woodlands occupied small areas, and the quality of timber was frequently inferior because of excessive grazing, cutting and damage by fire. Woodlands frequently occupied comparatively flat uplands. It was agreed that these flat woodlands should be left in pasture rather than to try to convert them to protected woodlands, unless the cover was particularly good and there was an apparent need for woodland in the farm unit. Wherever the C and D slopes were in woodland it was recommended that these be protected from fire and grazing to establish forest conditions which would retain the rainfall and prevent erosion. From the standpoint of good farm management some woodland is desirable on most every farm. It is likely that the best place for this timber is on the steep slopes, as such a plan would allow more efficient use of the level land on the farm.

A selective system of cutting that would maintain soil conserving conditions and discourage grazing or clear cuttings was initiated. Complete woodland management plans were worked out for each cooperator who desired protected woodland. Planting of seedlings, seed or cuttings for the control of erosion on certain severely eroded land was recommended.

The relationship between practices which conserve the soil and wildlife was recognized. The creation of new habitats for wildlife species by the retirement of waste areas, fencing and planting of stream banks and gullies was encouraged. Fence rows and margins of roads were also recognized as potential wildlife value.

By protecting these areas from fire and grazing, by a program of seed spotting, by planting desirable species of trees, shrubs, and herbaceous plants, and by shelter construction, environmental conditions will be improved for important wildlife species.

Such practices may be expected to benefit the soil conservation program by utilizing waste tracts and problem areas for the production of valuable game and fur-bearing mammals; by attracting certain non-game species, such as song-birds, which aid in controlling insect pests and noxious weeds; by creating an important recreational resource; and by adding attraction to the farm (Fig. 12).

Changes in the use of the land were considered of primary importance for the control of water and soil loss in the Blountsville area. To make such changes, it was agreed that the government should assist in the relocation of fences, planting of trees and establishment of semi-permanent cover, such as pasture or long-time meadow. Plans were made for furnishing a limited amount of labor, transportation, and materials, and heavy equipment for effecting the proposed changes in farm organization.

Extensive deposits of marl which averaged above 90 percent calcium carbonate were found within the project area. Since this material was an accessible local product, the Service decided to use marl rather than limestone in instances where liming material was to be furnished by the government, also to encourage its use by cooperators.



Figure 12. Small woodlot dedicated to wildlife as headquarters and as a simple system of travelways, thereby making the entire farm available to wildlife without sacrificing any appreciable amount of land. Fence rows leading from the woodlot consist of prickly ash, sumac, bittersweet, grape, hazelnut and plum.

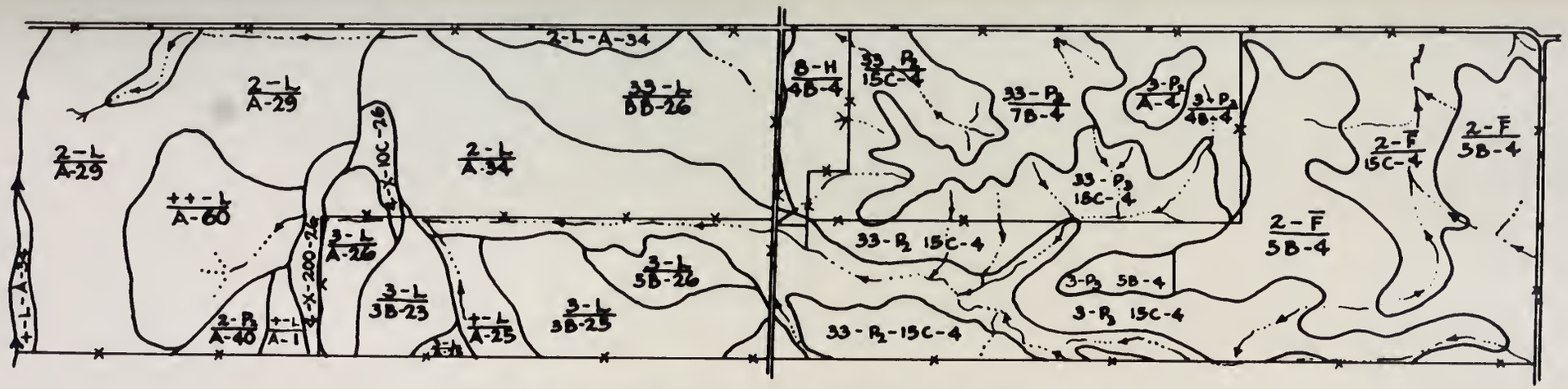


Application of Soil Conservation Plan to a Single Farm

The application of soil conservation measures on farms can be best explained by presenting the example of a typical farm in the project on which such measures were adopted. A rented farm along the Blue River will be considered. The conditions of this farm prior to revision in land use were similar to those on most farms along the valley. The farm consists of 140 acres, and for a number of years prior to 1938 was part of a 280-acre unit. The present owner is a business man and the renter a full-time farmer who is about 40 years of age.

These men seemed to understand the effects of soil loss and were interested in applying erosion control measures. Figure 13 shows the soil map for this farm. Reference to the symbol sheet on page 141 will indicate the erosion, land use, slope and soil. Reference to Figure 2 shows the relation of these soils to the position of the river and the upland. The farm occupied a position which reached between the symbols X and Y in relation to this figure.

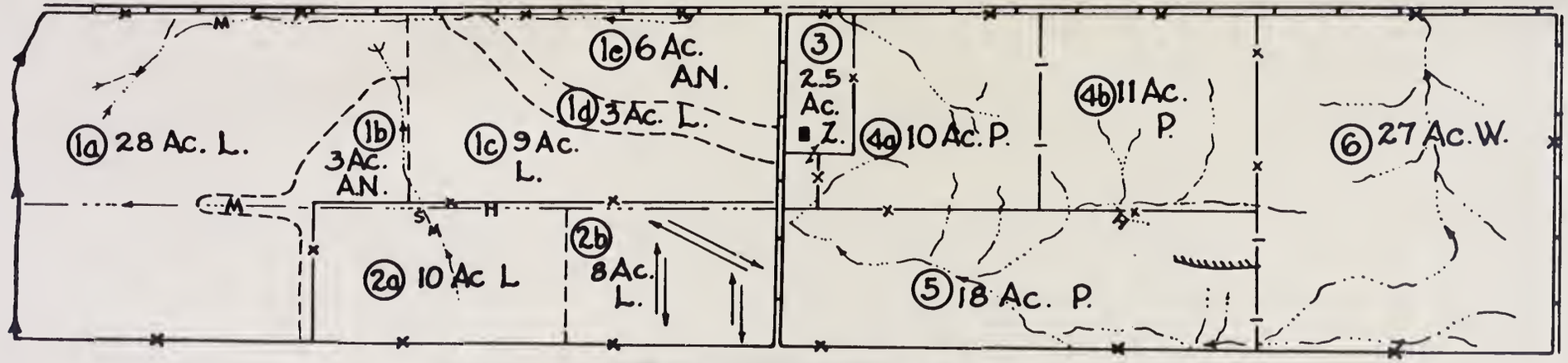
The operator used a tractor for tillage operations. He expected to feed all produce on the farm and market hogs and dairy products.



CONSERVATION SURVEY MAP

SHOWING EROSION, LAND USE, SLOPE, AND SOIL TYPE.

See page 141 for explanations of symbols.



LAND USE MAP

See page 140 for explanations of symbols.

FIGURE 13.

Figure 14 shows the land use on part of this farm in 1937. The numbers are the same as those designating fields on Figure 13. It shows that field 1 was made up of various kinds of soil and slope. There had been some attempt made to divide this field according to its capabilities in that corn was usually produced each year on the dark colored soils near the river (behind the camera). However, in 1937 the entire field was used for corn with the rows planted east and west. This was not unusual as the upper part of field 1 was ordinarily planted in that direction regardless of the lower part. This illustrates that the direction of cultivation was invariably conducted up and down the slope in such a manner as to hasten run-off and encourage soil loss. That soil loss did occur can be readily seen by observing the erosion symbols on the B and C slopes in this field (Fig. 13).

Field 2 has been used for crops in a 3-year rotation. In the spring of 1937, alfalfa was seeded in the wheat and failed except on the east half, because of the low fertility and high acidity. The east half is near the barn and likely received more than its share of manure. The slopes in this field are gentle and water flows from each end to the draw near the center.



Figure 14. This photograph was taken with the camera facing northeast from a high point in field 1b. The plow furrow is on the contour between fields 1c and 1d. The inked line in the foreground separates 1b and 1c. All numbers are the same as those shown in Figure 13.



Field 4 had been formerly in cultivation and was being used for pasture in 1937. The cover was extremely poor and consisted of a small amount of timothy, and Canadian bluegrass together with many perennial weeds, chief of which was fall aster. The former owner had contemplated plowing and reseeding this field to improve the pasture but he had been encouraged by the Service to mow it instead. This he had done and the results indicated a slight improvement.

Field 5 had been cultivated at one time but it has been used for pasture for a period of 20 years or more prior to 1937. The cover was average for the project area. Some active erosion was taking place in the main drainage course through this field. Cattle had access to this field and in fact, to all the land on the east side of the road at all seasons of the year.

Field 6 consisted of 27 acres of woodland. Evidence indicated that it had been pastured during a period of 10 or 15 years prior to 1937. There was an absence of young trees and the leaf litter had been largely destroyed. There was sufficient shade, however, to prevent the establishment of a grass cover. The absence of either leaf little or grass cover, together with the trampling of livestock obviously encouraged water run-off and soil loss. The previous owner had allowed neighbors to cut trees from this area for fuel wood during the winter of 1937. His object was to open the woods enough to allow sunlight to reach the ground so that he could establish the area in grass for pasture.

The soil map shows an area of about 7 acres of dark ground near the river which had received up to 3 feet of deposition. This material consisted mostly of topsoil from fields 2, 4, 5 and 6, which had been conducted to the bottom ground through an active gully between fields 1 and 2. Gully erosion in this drainage course had also contributed gravel which was decidedly detrimental to the area.

Control measures planned for this area will be discussed by field numbers which are shown on the land use map (Fig. 13).

Field 1a was designated as an area suitable for the production of corn each year providing the operator used a winter cover crop, returned all corn stocks to the soil, and cultivated this field in a north and south direction. Fertilizer applications were recommended for corn. The purpose of the cover crop was to assist in maintaining the organic matter, enhance water-absorbing power of the soil, and to provide some winter pasture for livestock.

Fields 1b and 1e were converted to an alfalfa-timothy mixture for hay. Under the terms of the basic plan this was desirable because field 1b had already lost 75 percent of the original topsoil and the topography of field 1e was hummocky so it would have been impracticable to plant row crops on the contour. The use of these fields for alfalfa should help supply the hay for livestock and reduce soil and water loss. Marl and fertilizer were used in establishing these stands of meadow in oats in 1938.

Field 1c consists of about 9 acres of Genesee soil. The fertility of this soil is good and it is in condition to grow legumes without the addition of limestone or marl. The comparatively level slope is not subject to severe erosion; therefore a 2-year rotation was planned for this field consisting of corn and wheat. Sweet clover and alsike clover are seeded in the wheat and supply organic matter and nitrogen in addition to winter cover preceding corn (Fig. 15).

Field 2a consists of about 10 acres of Fox soil. The fertility was only average and moisture somewhat deficient. Marl was supplied for this area to encourage legumes. The rotation planned consisted of corn, wheat, hay and hay. Cultivation will be conducted in a north and south direction, across the slope.

Fields 2b and 1d make up a second unit which are in a 4-year rotation as described for 2a. Cultivation on field 2b will be conducted across the slope which requires a turn row as shown on the land use map. Field 1d is a strip 100 feet wide and is laid out on the contour so that cultivation will be on the level. It is to produce the same crops in the same year as field 2b.

With two units producing corn once in 4 years and a third once in 2 years, it is possible to have corn on one of these three units each year, in addition to the corn produced each year on field 1a. This arrangement also allows from 9 to 11 acres of winter grain each year.

The balance of the farm or that on the east side of the road is being used for woods or pasture.



Figure 15. This shows how the land was used in 1940. Alfalfa occupies the area in the foreground and in front and to the left of the house. Field 1c was in wheat in 1939, and an excellent stand of sweet clover and alsike was obtained and plowed down for the 1940 corn crop.

Field 4 was divided into two parts. Part 4b contained the most bare ground and there were several active gullies along the south side of this field. The gullies were sloped, contour furrows were constructed on the watershed above them, and the entire 11 acres, except a small area in trees, was treated for pasture improvement (Figs. 16, 17, 18 and 19).

The treatment consisted of the application of 3 yards of marl, 350 pounds of 0-14-6 fertilizer, and about 15 pounds of legume seed to the acre. The area was thoroughly disced and the seed and fertilizer applied with a drill. The seed mixture consisted of about equal parts of alfalfa, sweet clover and lespedeza.

A fence separating 4a and 4b was constructed in August 1938, and 4b was not grazed during the balance of the year. The results were outstanding. Sweet clover and alfalfa made a good stand of deep-rooted legumes which in time stimulated the grass already present. The operator believes that this area supplied more pasture in 1939 than fields 4a and 5 combined. Management to perpetuate the stand of deep-rooted legumes is as essential if this type of treatment is to be successful.



Figure 16. The gullied area in field 4b is shown in this photograph. The sides of the gully have been sloped and the construction of contour furrows has been begun, April 1938.





Figure 17. As a result of treatment and seeding erosion has been controlled and valuable pasture is being produced.





Figure 18. The weeds were clipped in the summer of 1937. The marl shown here was spread with a manure spreader.





Figure 19. An excellent stand of grasses and legumes occupied this ground in 1940.



Field 4a received the same treatment in 1938-1939 except that fertilizer was broadcast with the marl in the fall and the legumes were broadcast in the spring, followed by a moderate discing. The results were unsatisfactory. It is apparently essential to apply the seed and fertilizer with a drill so that they come in close contact with one another. Considerable volunteer white clover is appearing in this area and the results of the treatment may yet prove satisfactory in spite of the failure of the deep-rooted legumes.

Field 5 remained in permanent pasture. A short diversion ditch was constructed at the east end of this field to control a small area of gully erosion near the woodland. Some pasture fertilization and reseeding was accomplished in this area (Figs. 20 and 21).

To control the grazing on the pasture area, the owner constructed a barnyard fence. Cattle now have access to the pasture areas during the pasture season only.

Field 6 was fenced by the owner to exclude livestock. No supplemental planting or woods improvement was considered necessary. During the last year the owner has taken advantage of the Indiana State Forestry Classification Law, whereby he agrees to maintain this area indefinitely for the production of timber products.



Figure 20. A short diversion ditch designed to remove surface run-off and keep it from entering the gullied areas which have been sloped preparatory to seeding. This photograph shows a part of field 5. The land in the foreground is that of a non-cooperator.





Figure 21. The seeding has been fairly successful in spite of complete lack of protection to the treated area.



It will be noticed by the map of this farm that the drainage area beginning in the woodland and permanent pasture forms a definite water course passing through field 5 and continuing on a line between fields 1 and 2, to the river bottom area. All of the lower part of this drainage course, including most of that which passes through field 5, was an active gully in 1937. The lower part of the system between fields 1 and 2 was planted to trees and shrubs for vegetative cover. Species suitable for food and protection of wildlife and for the production of fence posts were used. Only a small amount of sloping and sodding of gully heads was done in field 5.

It is believed that the improvement of the pasture cover and the protection of the wooded area from livestock will result in reduced run-off and a less serious problem in relation to the drainage courses. It should also be noted that a field of about 20 acres on a neighboring field, adjacent to field 5 and similar in topography to field 4, contributes water to this drainage course. The owner of this area has adopted the same sort of treatment as described for field 4b and has converted this area from cultivation to pasture use.

This represents a spread in practices and should be of considerable assistance in controlling the erosion on the drainage course on this farm. Sod waterways have been established and will be maintained in the cultivated lands in fields 1 and 2.

The farm plan provides for maintaining the upper part of the watershed in timber. The rolling, well-drained land is in a more or less permanent type of cover such as pasture or alfalfa, the more level light-colored soils are in cultivation across the slope in rotations suitable to their capabilities, while the level dark colored land bears the most intensive cultivation.

Plans making similar land use changes were completed for about 20 farm units in the demonstration area. The balance of the agreements required simple erosion control practices including longer rotations, sod waterways, pasture management and contour tillage but were less complex than the plan described.

SURVEYS AND SPECIAL STUDIES

Meadow Establishment

Successful meadow establishment is an essential part of a rotation designed to control erosion. There are two principle reasons for this: First, a good meadow is a close-growing crop which largely prevents soil and water loss during the time it occupies the land; second, the development of root tissues, particularly of the grasses, tends to maintain the supply of soil organic matter. Organic matter aids materially in the absorption of water during the period of clean cultivation.

During 1939 a study was made on farms of cooperators of the practices which contribute to successful meadows.

Seedings were made from the middle of February to the middle of May. In general, the seedings made in March and early April seemed more satisfactory than those made at an earlier or later date.

On 36 fields the seedings were broadcast with no attempt to cover the seed, while on 35 fields the seed was covered by drilling, discing, harrowing, cultipacking or some other method. A comparison of the results is shown in table 9.

These results seem to indicate a slight improvement in results from covering the seed. It is recommended that this method be used wherever possible. It is apparent, however, that success is not necessarily assured by covering the seed.

In a study of companion crops it seemd that where the legume seed was covered, wheat made a better companion crop than oats. On most of the farms considered in this study, the use of fertilizer on corn and wheat was a common practice. Of the 71 fields on which data were obtained, 56 were wheat fields and all but two received fertilizer at the average rate of 196 pounds of 2-12-6 or equivalent to the acre. Only two wheat fields received no fertilizer while all of the 15 oats fields received no fertilizer.

It seems from these results that the fertilizer treatment on the small grain influenced the following stand of legumes.

Table 9. Results of various types of seeding

Method of Seeding	Very Good	Good	Fair	Poor	Failure	Total
Broadcast, not covered	2	13	9	9	3	36
Seed covered by disc, harrow, etc.	5	13	9	3	5	35

On 42 fields data was obtained with respect to the need for lime as a soil amendment for the successful production of legumes. Twenty-three fields were found to be in need of lime, while 19 had either received lime or marl recently or were not in need of lime according to test. The results from legume seedings made on these fields are shown in table 10.

The time and method of seeding were comparable in each case. Of the two failures, according to the owners, one was the result of extra heavy wheat-straw and the other failed because the seed was covered too deep.

Conclusions.

The results demonstrate the need for lime in obtaining successful stands of legumes for erosion control.

Reasonably early seed on land carefully manured and where the companion crop has received commercial fertilizer, are most likely to succeed.

Covering the seed with a harrow or cultipacker or direct drilling is usually beneficial.

Correlation of Tree Species to Planting Site Soil.

Cultivation often results in soil loss and in an unfavorable physical condition of the soil even though erosion may not have been serious. Because of this it is difficult or impossible to obtain satisfactory growth from many of the common trees when planted for erosion control. For this reason it is necessary to select varieties for planting which will survive poor soil and moisture conditions.

Table 10. Results of lime treatment on legume seedings

Lime Requirement	Kind of stand					
	Very good	Good	Fair	Poor	Failure	Total
Lime required	1	5	4	8	5	23
No lime required	5	11	5	1	2	19

Investigations indicated that seedlings of all the common hardwood trees such as oak, tulip poplar, ash and walnut failed when planted on Miami or Bellefontaine silt loam if the area was in sod at the time of planting. Likewise, if the area was severely eroded but not in sod, failure resulted. However, such trees were planted successfully in open, un-eroded spots in woodland which had not become established in sod.

On areas where some topsoil remained on Miami, Bellefontaine, Crosby and Brookston silt loams, plantings of red and white pine were successful regardless of sod. Plantings of austrian and pitch pine were successful on Miami and Crosby under similar conditions.

Red and white pine planted in parent material (3 feet of soil material removed through erosion) or in thin layers of subsoil have failed.

The use of black locust for erosion control planting appears successful under nearly all conditions. This is based on observations made to date and may yet prove inaccurate. Good growth of locust has been noted on Miami, Bellefontaine, Crosby, Brookston, Fox, Genesee and Eel silt loams. This list includes all the soils on which plantings were made. There is one notable exception to the success of black locust plantings. On severely sheet eroded areas of the upland soils where all the topsoil and subsoil have been removed, thus leaving the highly calcareous parent material exposed, the growth of locust is very poor, and, in many instances, complete failure has resulted (Figs. 22 and 23).



Figure 22. This area was fenced and planted to black locust in 1937. The light-colored area at the left is parent material, from which all the topsoil and subsoil has been lost.





Figure 23. This photograph was taken from the edge of the parent material area shown in Figure 22. Most of the locust planted here in 1937 died. Subsequent plants of locust and pine have failed to make satisfactory growth.



Failure has resulted from gully plantings in parent material where the soil conditions have not been influenced by the sloughing off of adjacent topsoil or subsoil. There may be several reasons why the plantings failed on these areas of parent material. The texture of parent material is very heavy. It seems to absorb water more slowly than topsoil and it is apparently affected severely by drougth. Since it is extremely low in plant food and organic matter, it supports little, if any, vegetation. Lack of vegetation undoubtedly contributed to a very high soil temperature. The use of 2-12-6 fertilizer at the rate of about 100 pounds to the acre applied in the hole at planting time did not show any benefit to locust plantings in these areas.

At present, due to the lack of sufficient information, no recommendations for species or treatment on parent material area can be made from the woodland planting standpoint.

Rodents.

Serious rodent (field mouse) damage occurred on locust plantings in bluegrass sod areas. The mice girdled the young trees to a height of 15 inches. In several cases this damage occurred during the second growing season. Almost all the trees were killed in some planting areas. As soon as this condition was noticed plots were established in which the sod, which had re-established itself in the original scalped areas for planting, was removed for a distance of 15 inches from the steam of each tree.

No future damage was noticed in the treated areas. It is recommended that where it is necessary or desirable to plant black locust in sodded areas that the sod be removed from an area at least 24 inches square previous to planting and that this area be kept free of sod for 2 or 3 years or until the bark becomes unpalatable to the mice.

Mulching.

Several areas were mulched with straw at planting time but the results were inconclusive since there was considerable mouse injury to the treated trees.

Fertilizing.

The use of 2-12-6 fertilizer at the rate of about 100 pounds to the acre planted in the hole at planting time has been beneficial to the establishment of black locust trees. The improvement in stand and growth during the first 1 or 2 years seems to justify the small expenditure.

Direct seeding.

Some direct seeding of both heavy (walnut, oak, etc.) and light (maple, ash, etc.) seeded species was attempted. Such seedings were made both in the woods and in cleared areas. Black walnut survived in all cases but growth was poor on all except the best sites. All other direct seedings failed except those made in open wooded areas in the absence of sod.

It is recommended that direct seeding be confined to the use of black walnut and acorns in wooded areas. The only possible exception would be the use of walnuts in rich bottom lands where the soil is loose and well-drained and where there is no danger of rodents or squirrels eating the seed.

Corn Yields and Erosion

In the fall of 1939, 250 yield samples were taken from six corn fields on five farms within the project area. The method consisted of harvesting and weighing corn from four adjacent hills of checked corn at places selected at random, or in cases where the corn was drilled, from two adjacent rows, 8 feet long, selected at random. In each case the quantity of corn harvested constituted one sample. The soil type, erosion conditions, and slope were determined for each sample. Samples were taken from all parts of the field but most samples were obtained from Miami silt loam. This soil undoubtedly suffers the most severe erosion losses of any soil in the area. This is true because of its general predominance and because of its slope and topography.

The results from 197 samples obtained on Miami silt loam under the various erosion conditions and related data are shown in table 11.

While it is realized that these results were obtained from 1 year's study, nevertheless they demonstrate the necessity of conserving the topsoil.

In considering these results it should be realized that 1939 was the most favorable year for corn on the "clay points" in the recollection of most farm operators. Also, that almost without exception, it has been the usual practice to apply manure to the most severely eroded areas of a field at the expense of the un-eroded portions of the same fields.

Table 11. Relation between erosion and corn yields

Erosion conditions	Number of Samples	Percent of Miami silt loam in this condition[1]	Bushels of corn per acre
Topsoil remaining 6" or more	75	58.7	54.6
3" to 5" topsoil	50	23.0	40.8
0" to 2" topsoil	42	16.5	36.7
Subsoil eroded parent material exposed	9	1.0	27.0
Deposition on top of original Miami profile	21	.8	67.5

[1]Approximate figures as obtained from an analysis of conservation survey data on 8868.5 acres, representative of the area.

Those who harvested the corn in this study noted a marked difference in the quality of the corn from various parts of the same field. Samples obtained from severely eroded areas were light and chaffy as compared with samples from un-eroded areas.

Soil and Water Loss Plots

Two sets of plots were established in the spring of 1938 to demonstrate the soil and water loss as these factors were influenced by slope and plant cover. Each set of plots consisted of four sub-plots of one-hundredth acre each. The sub-plots were 6 feet wide and extended up the slope a distance of about 73 feet. Strips of sheet metal formed the separators. Pits at the foot of the plots collected soil and water loss which was measured and recorded.

A set of plots on a 17 percent slope of Miami silt loam was used to measure the loss under forage crops. The crops produced on the four sub-plots were alfalfa alone, alfalfa and brome grass, permanent pasture, permanent pasture, contour furrowed. The results obtained are shown in table 12.

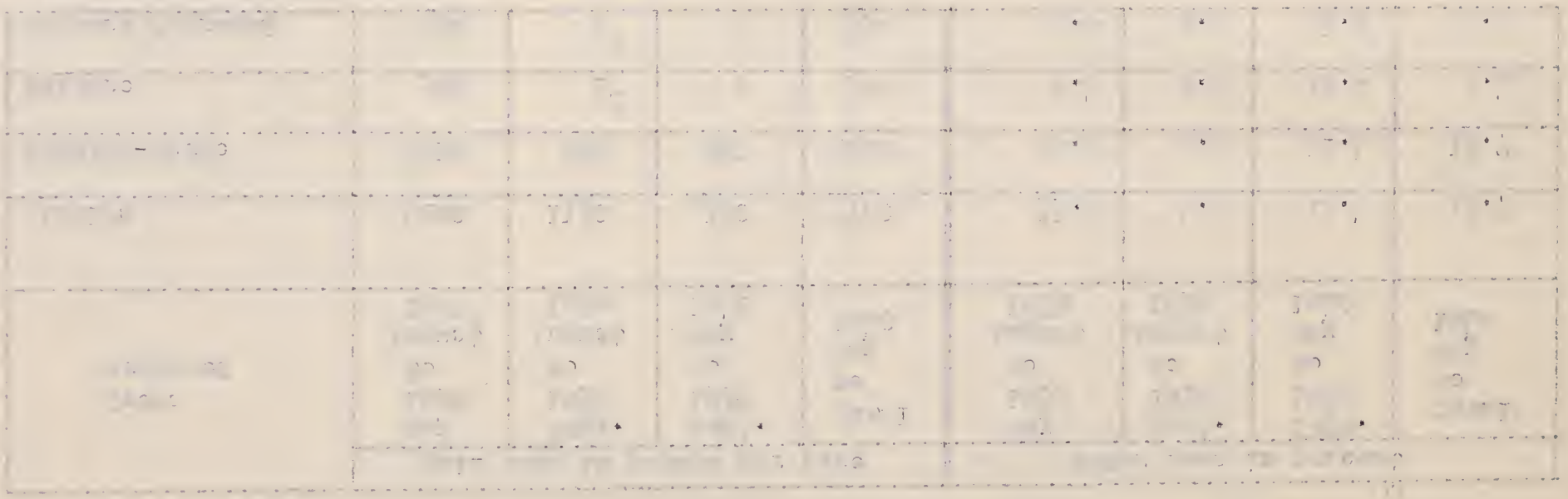
The greatest soil and water loss occurred during the summer that the alfalfa was becoming established. Contour furrows in permanent pasture were effective in reducing run-off but the amount of water saved was small. The dry weight of hay produced in 1939 was 7,375 pounds per acre for alfalfa alone, and 7,950 pounds for alfalfa and brome grass. The green weight of grass produced was 2,780 pounds for the permanent pasture and 4,145 pounds for the permanent pasture contour furrowed.

Table 12. Relation between soil and water losses, and crops

Crops produced	Soil loss in pounds per acre				Water loss in percent			
	May 1938 to August 1938[1]	Sept. 1938 to August 1939	Sept. 1939 to May 1940	Total to May 1940	May 1938 to August 1938	Sept. 1938 to August 1939	Sept. 1939 to May 1940	Total to May 1940
Alfalfa	4200	1150	350	5700	33.0	4.2	11.4	13.7
Alfalfa-brome	4310	800	350	5460	31.3	4.9	11.4	13.7
Pasture	300	0[2]	0	300	6.4	5.5	11.0	7.4
Pasture furrowed	350	0[2]	0	350	4.8	2.5	11.9	5.7

[1]All dates are inclusive.

[2]The amount collected was so small and badly mixed with grass hopper remains that the weight could not be determined.



In this study the two alfalfa plots should be considered as the same cover as the brome grass failed to make a satisfactory stand. This cannot be explained unless the soil was so low in available nitrogen at the time it was seeded that it failed to establish itself. Other seedings of brome grass in the project area have been successful.

The second set of plots were on a 7 percent slope of Miami silt loam. Regular rotation crops were produced on these plots. Sub-plot 1 was in corn in 1938, 1939 and 1940, without manure or a winter cover crop. Cultivation was up and down the slope. Sub-plot 2 was in corn in 1938, wheat in 1939, soybeans in 1940. Sub-plot 3 was in oats in 1938, hay in 1939, and corn in 1940. Sub-plot 4 was in poor quality pasture in 1938, corn in 1939 and wheat in 1940. The plots were limed and fertilizer practice comparable to general farm practice was followed on corn and wheat. Corn produced on sub-plots 2, 3 and 4 was cultivated across the slope.

The results obtained are shown in table 13.

The continuous corn plot lost about 17.5 tons of soil to the acre during the 25 months of this study.

Table 13. Relation between soil and water losses, and crops

	Crops Produced			Soil loss in pounds per acre				Water loss in percent			
				May 1938 to August 1938	Sept. 1938 to August 1939	Sept. 1939 to May 1940	Total to May 1940	May 1938 to August 1938	Sept. 1938 to August 1939	Sept. 1939 to May 1940	Total to May[1] 1940
	1938	1939	1940								
1.	Corn	Corn	Corn	8200	19675	7460	35335	22.1	20.8	28.2	22.35
2.	Corn	Wheat	Soybeans	8450	2855	125	11430	20.5	8.8	7.0	10.12
3.	Oats	Hay	Corn	1650	620	250	2520	28.3	11.9	15.5	15.5
4.	Pasture	Corn	Wheat	600	2850	1000	4450	23.0	12.1	6.5	11.9

[1] All dates are inclusive.



Several storms of heavy rainfall occurred during the 1938 season and during that year there appeared to be no advantage to contour tillage. During the period January 1, 1939 to June 1, 1940, however, there were eight rains which produced run-off from the continuous corn plots but failed to produce run-off from any of the other plots in this system. General observations indicated that contour tillage was an aid to erosion control except during the 1938 summer season.

Although considerable run-off was collected from sub-plot 3 from September 1939 to May 1940, inclusive, there was very little soil loss. The aftermath of this plot seemed to keep the ground frozen during early spring and may be the cause of these results.

Pasture Fertilization

Test plots for measuring the effect of pasture fertilization were established on seven farms. Fertilizers of analysis 0-20-0 or 0-14-6 were usually applied broadcast with or without cultivation. In some cases white clover or other legume seed was also applied. Results were measured by clipping small areas which had been protected from grazing with removable wire cages. In general, 300 to 400 pounds of 0-20-0 fertilizer to the acre showed an increase of 10 to 60 percent of dry weight of the grass harvested. Increases from 0-14-6 seemed to be in proportion to the quantity of phosphorous applied. In other words, potash did not appear to produce increased yield. The observations on the improved character of the forage indicated that the improvement in plant species was more important than the increase in weight of dry matter.

In several cases the weight of the poor quality forage on untreated plots nearly equaled the weight of high quality forage on the treated plots.

The methods used in this study were not satisfactory. From present experience, it appears that pasture treatment should take the form of renovation as described for field 4b, page 81. The results of treatment might better be measured by the pasture days of grazing supplied, pounds of grain, or milk produced, or some similar means in a comparison with an equal area of untreated pasture.

ACCOMPLISHMENTS

Changes in The Use of the Land

Figure 6, page 27, shows how the application of conservation measures affected the use of the land on the farms of 48 cooperators. In general, the acreage of land to be used for regular production of crops in rotation was decreased by about 15 percent or about 416 acres. Most of this land found use as long-time meadow and grass mixture for hay or pasture. The balance was converted to permanent pasture or woodland, or used for wildlife.

Figure 11, page 65, also indicates that there was a decrease in permanent pasture. Most of this decrease was brought about by the fencing and protection of woodland formerly used as pasture. Because this type of land produced only a small amount of forage suitable for grazing, the decrease in available pasture was not greatly affected.

One of the most significant changes in the use of the land was the increase in the acreage used for grass and legume mixtures as long-time meadow. Land suitable for this use is that assigned to land use capability class III or IV and consisted mostly of land formerly used in rotation (Figs. 24 and 25). A mixture of timothy and alfalfa was satisfactory for a period of about 2 years, after which the timothy disappeared from the mixture. A seeding of 10 pounds of alfalfa and 5 to 7 pounds of smooth brome grass to the acre was more satisfactory as the brome grass was able to hold its own with the alfalfa. It was palatable both as pasture and hay and apparently increased the total forage of the acre.

There was likewise a considerable increase in the amount of land used for woodland or wildlife. The increase was brought about by the shift in the use of land assigned to capability class IV or V.

The use of land on the farm of cooperators was dependent upon the erosion control practices which could be applied, in addition to such factors as soil, slope and erosion.



Figure 24. This is a typical example of land which is unsuited for row crops. It has been used for regular rotation crops for many years and soil loss was severe. It was fall plowed following corn in 1936 prior to the agreement. The gullies formed during the winter required plowing in before the field could be worked down in the spring of 1937.





Figure 25. Marl at the rate of 2 yards to the acre, 300 pounds of 0-20-0 fertilizer and 10 pounds of alfalfa seed has controlled soil loss and made this area profitable to the cooperator. This photograph was taken in the spring of 1940, 3 years after it was seeded to alfalfa.

Practices Applied to Cultivated Land

Contour tillage was considered one of the most important means of erosion control on land which was to be used for cultivated crops. This type of treatment was specified as essential on 1,085 acres. This practice was difficult to apply to the land in the project area because of the lack of uniformity of slope and topography. It was most commonly applied to such soils as Fox, Westland and Abington, which occupy the Blue River Valley.

The prevailing method of tillage of these soils was formerly up and down the slope. Contour tillage was easily adapted in such cases by merely changing the direction of planting. Many of the cooperators maintained the system of checking the corn planted on these fields, but they arranged to plant, cultivate, and seed across the slope.

Strip cropping as an erosion control practice also made use of contour tillage. Strip cropping, as ordinarily considered, where a number of strips of more or less uniform width occupy a given slope, one above the other, was almost impossible. In most instances the various strips of a strip cropping system were in reality areas of different land use capability classes. Thus the individual strips in a system frequently represented changes in the use of the land from the standpoint of length of rotation, and crops contained in the rotation. They were so arranged that contour tillage was the natural order of cultivation. Strip cropping systems of this type were specified on 320 acres.

Figure 6, page 27, shows the change in use of crop land on the farms of 48 cooperators. It will be noted that clean-tilled crops formerly occupied almost 60 percent of the cropland on these farms. This was reduced to about 40 percent of the crop land and the acreage of small grain and hay crops was appropriately increased. The percentage of cultivated land for the various kinds of crops with respect to their ability to control soil loss on farms of cooperators was approximately as follows: Clean-tilled crops about 40 percent; semi-erosion resisting crops, such as small grain, about 30 percent; and erosion resisting crops such as hay, about 30 percent.

Most of these changes in the use of cultivated land were brought about by lengthening the rotations on upland from the common 3-year rotation of corn, wheat and hay, to a 4-year rotation of corn, wheat, hay, hay or pasture, or by the use of a 2-year rotation of corn and wheat with a legume inter-crop in place of the common practice of producing corn each year on dark-colored bottom lands.

To make use of deep-rooted legumes in the rotation the use of limestone or marl was advised on 67.1 percent of the land used for the production of cultivated crops. The area receiving this soil amendment was 1,788.5 acres. Marl was used considerably because it was available in the area and easily accessible. The usual rate of application was 3 cubic yards to the acre, which was equivalent to approximately 2 tons of good quality ground limestone.

Results obtained from the use of this material have been satisfactory (Fig. 26). From the present observation it now appears that the use of lime is an important factor in the control of soil erosion and that an even more general use of this material should be made than was specified in the cooperative agreements.

The use of sod waterways was specified in 53 cultivated fields.

The use of fertilizer was a common practice on corn and small grain in the regular rotation. Cooperative agreements encouraged the use of a heavy application (300 to 400 pounds) of 20 percent superphosphate in the establishment of legume-grass mixtures for long-time meadow on land of use capability classes III or IV. Two hundred fifty-four and two-tenths acres of land in this class were treated with fertilizer in 1937 and 1938.

Three thousand one hundred and forty-five lineal feet of diversion ditches were constructed on four farms to divert the surface run-off from class III, IV or V land and to prevent it from damaging class I or II land.



Figure 26. The use of marl at the rate of 3 yards to the acre was responsible for the good stand of alfalfa on the area at the right of the photograph. The area to the left received no marl.



Terraces were constructed on 14.8 acres of land use capability class III and IV land. Generally speaking, terraces were not found to be adaptable as an erosion control measure on the soil types in the area.

The use of rye, sweet clover and hairy vetch, or a combination of these crops seeded for a winter cover crop was a practice applied to 500 acres.

Practices Applied to Pasture Land

The control of erosion on permanent pastures was encouraged through a system of pasture management designed to improve the type and character of cover on 2,046 acres of pasture land.

Pasture treatment or renovation, consisting of the application of limestone or marl, fertilizer and seed, was conducted on 581.6 acres of permanent pasture land. In addition, 173 acres of new pasture was established through treatment and seeding.

Contour furrows for the retention of rainfall were constructed on 202 acres of pasture land. Vegetation was re-established on the furrowed areas by treatment and seeding and temporary protection from grazing.

Gullied areas in permanent pastures were successfully revegetated and the erosion control through sloping, fertilizing and seeding and temporary protection from grazing. The use of brush on the treated gullied areas to exclude the grazing of livestock was found to be a satisfactory method of temporary protection.

The most successful means of renovation of permanent pastures consisted of the broadcast application of marl at the rate of 3 or 4 cubic yards to the acre in the fall of the year. The following spring the area was thoroughly disced and fertilizer consisting of 20 percent superphosphate or 14 percent phosphate and 6 percent potash applied at the rate of from 300 to 400 pounds to the acre, with a disc drill. At the same time, deep-rooted legumes such as red or alsike clover, sweet clover or alfalfa were applied at the rate of 10 to 15 pounds to the acre. The success of this type of renovation depends somewhat on the ability of the cooperator to regulate the grazing on the treated areas. For that reason the results of the treatment were more apparent where the treated areas were fenced apart from the balance of the pasture acreage.

Top-dressing permanent pastures with phosphate fertilizer has increased the white clover content and improved the pasture cover but the results have not been as outstanding as the renovation treatment.

The construction of fences and the use of barnlots for the confinement of livestock during the non-grazing season has contributed to successful pasture management on several farms. The successful management of permanent pasture was facilitated by the grazing of a grass-legume mixture which was a part of the 4-year rotation placed in operation on the farms of 25 cooperators.

Practices Applied to Woodland

About 10 percent of the land covered by cooperative agreements was set aside for woodland. The cooperators agreed to protect this land from fire and grazing and to use it for the production of wood or wood products only.

Of the 262 acres set aside for this use, 71 acres had been cleared and cultivated prior to 1936. A total of 111,000 trees and 10,600 direct seedings was used in planting this 71 acres, which was divided between 24 farms.

Black locust was used chiefly for erosion control and field planting because of its ability to survive on poor soil, its adaptability to replanting and its value for post timber on the average farm (Figs. 27 and 28).

Some field plantings were made with hardwoods, such as ash, oak, tulip poplar and walnut. Several varieties of pine were also used, including white, red, austrian and pitch pine. Pine was used for new border plantings, for windbreak protection and wildlife cover. Direct seedings were made with desirable hardwood species, such as ash and walnut in several open wooded areas.

The center-hole and modified center-hole methods were used in planting seedlings and the results to-date show that this type of planting has been satisfactory.



Figure 27. This is a part of a 6-acre area planted to locust and other forest trees in the spring of 1937. This photograph shows the area just after it was fenced, temporary dams constructed in the gully and trees planted.



Figure 28. The planting and protection had almost completely controlled soil loss when this photograph was taken in the spring of 1940. The locust had attained a height of from 10 to 15 feet.

Woodland improvement constituted an important phase of the program concerned with the management of timber land. The woods improvement program dealt, for the most part, with the removal of dead, dying, diseased and inferior trees where they would interfere with natural reproduction and desirable forest conditions.

Methods by which the farm woodland owner could improve both the quantity and quality of woods products was demonstrated on 24 acres on 9 farms. The amount of products removed in improving 24 acres of woodland was as follows: 626 fence posts, 75 cords (4' x 4' x 8') of firewood and 2,800 board feet of saw logs.

No specified method of silvicultural treatment was followed because of the condition which existed, especially as to number of trees of desirable species.

Figure 29 shows a woods before improvement cutting and figure 30 shows the same woods just after cutting.

All tree tops, excluding those suitable for firewood, were lopped and scattered to form a protective cover against the excessive loss of soil moisture through surface evaporation.

The products of the woods improvement were processed and left in the woods to season.



Figure 29. This woodland has not been subjected to grazing for a number of years, but the owner has not practiced a system of management to encourage the most desirable tree species.



Figure 30. Certain trees have been removed for firewood and fence posts and the brush has been scattered. The results should be more rapid growth for the desirable trees.

Observations to-date show that where woodland has been protected from grazing, natural reproduction of desirable species has occurred. Desirable forest soil conditions are being re-established in most cases. The chief exception is in woodlands where bluegrass sod was present at the time they were fenced. Protection of such areas has resulted in a vigorous growth of bluegrass which has prevented natural tree reproduction. In cases where it is desirable to protect a woodland in which bluegrass is present, it is recommended that black walnut, white ash and red oak seedlings be planted in areas at least 24 inches square, from which the sod has been scalped.

In addition to the recommendations set forth in the cooperative agreements, management plans were prepared for six cooperators in which recommendations were made for future handling of the woods. These management plans have an analysis of the need for woodland on the farm, an inventory of the present timber, an average of the yield which might be cut each year without destroying the productive capacity of the woodland, and other instructions for proper management.

Most of the cooperators appreciate that woodland is an economic part of the farm and that proper handling of the woods, including protection and management, is essential to the production of woods products and the protection of certain land from erosion.

Practices Encouraging Wildlife

Plantings for erosion control were planned to include such food trees and shrubs as the walnut, mulberry, Canada plum, hazelnut and dogwood as an encouragement to wildlife. Wherever suitable areas for wildlife existed on the farm the cooperator was encouraged to manage them in such a way as to encourage birds and small game. No large areas were set aside particularly for wildlife. A typical gully planting area which serves the dual purpose of erosion control and wildlife habitat is shown in Figures 31 and 32. This area has already become the home of many birds and small game animals. Adequately protected from livestock, it will continue to produce both economic and esthetic value in a spot that was formerly waste land.

Spread of Conservation Practices

In 1940 there were 26 farms in or adjoining the project area on which the owner had applied one or more soil conserving measure as a result of the demonstration project. On 19 of these farms changes were made in the use of the land. The land most subject to soil loss was converted to pasture or meadow. On seven farms an effort was made to cultivate more nearly on the level or sod waterways were established. In most cases these changes in practices or use of the land were made as a result of suggestions offered by the conservationist who visited the farm. Thus many farmers accepted part of the conservation idea even though they were unwilling to sign a cooperative agreement. There are no known examples within the area of non-cooperators who have constructed terraces, or diversion ditches, or planted trees for erosion control.



Figure 31. This gullied area has been fenced and prepared for planting. Before treatment it threatened to destroy or impair many acres of pasture land.





Figure 32. Planted in the spring of 1938. The trees in this area have prevented further soil loss and created a valuable habitat for birds and small animals.



Farm owners from other counties in central and northern Indiana who visited the project doubtlessly adopted erosion control practices but the number is not known. Conservationists at the project assisted in preparing erosion control plans for one farm in each of 11 counties in central Indiana for use as county demonstration farms. Only technical assistance was furnished for these farms.

PROBLEMS ENCOUNTERED IN FITTING THE CONSERVATION PROGRAM TO THE LAND AND TO THE PEOPLE

Farmer Attitude

Because soil loss had not greatly reduced farm income at the time the project was initiated there was little inclination on the part of land owners to request assistance. However, conservationists made a special effort to visit every farm and explain the need for erosion control. In addition to the 48 cooperating farms there were 168 farm units on which agreements could not be obtained. The opinions expressed or implied by non-cooperating land owners or occupiers were recorded and are presented below. In some cases the farm was not suitable for an erosion control demonstration, because of the land use or natural physical features. That also was recorded and is shown as item 7 in this list.

Fifty-three farmers expressed only one reason, seventy expressed two reasons, thirty-five expressed three reasons, and six expressed four reasons for non-cooperation. Records were not obtainable for four farm units. No doubt there were other objections which were not expressed but this gives an indication of farmer attitude toward the work.

Reasons for non-cooperation:

	Number of owners or land operators who expressed or implied this reason.
1. Has other interests or employment	43
2. Joint ownership or management, one or more non-cooperative	32
3. Farm is for sale or may be sold for debt.	31
4. Field rents tillable land	30
5. Too old to have interest in conservation	30
6. Not interested	28
7. Land in pasture or flat, no serious erosion problem	27
8. Opposed to help or interference by any program sponsored by this political administration	25
9. Does not need help, can handle his own affairs	19

10. Discounts effect of soil loss 12

11. No farm buildings 9

12. Feels that a conservation plan would restrict income 9

13. Believes he could not do what was asked of him, financially or otherwise 9

14. Refused to consider 6

15. Believes contour tillage impractical or impossible 6

16. Expects to get something for nothing 6

Those who signed cooperative agreements were usually doubtful about the benefits which they might derive, and apparently felt that their rights and liberties were restricted by the farm plan. After the first 1 or 2 years this attitude changed to that of willing and voluntary participation, and a gradual trend toward the conservation thinking and action has developed.

Many cooperators have said that they did not see the urgent need for action until after they signed agreements. For example, one of our best cooperators says that his conception of erosion, in 1936, was a ditch which hindered normal tillage operations. If it could not be plowed in and crossed with farm tools it was serious. Since such a condition did not exist on his farm he felt that his erosion problem was very slight. Others recognized their loss through erosion but were unable to visualize the simple land use changes which now insure safe use of the land.

The Community Viewpoint

The community attitude in the beginning closely paralleled farmer attitude. If it differed it was slightly more favorable to the program. Many local people, both rural and urban, were unfamiliar with our work in 1940 although the project had been in operation several years, but when it was explained to them they were almost universally favorable.

Regardless of the excellent cooperation of the local daily newspaper, personal contacts between members of the service and local people has been the most effective means of obtaining community support. Our work is often confused with that of the Agricultural Adjustment Administration. A general understanding of the functions of these two organizations would be of mutual benefit.

The county land use planning committee had its beginning after the project was established and its chairman was a cooperator. The study of land conditions by this committee furthered the conservation attitude. Their recommendations included many of the practices initiated in the demonstration area.

One of the factors which influenced community attitude was the mortgaged indebtedness of farm land. Approximately 60 percent of the land was mortgaged in 1937. Loans had been placed in force which ranged from a few dollars an acre to $100 an acre. The most common rate in force was between $30 to $40 an acre. The holders of mortgages on farm land and the approximate percentage of the mortgages they held was as follows:

Federal Land Bank or Land Bank Commissioner.....	57	percent
Life Insurance Companies.....	16	"
State School Fund.....	8	"
Local Banks.....	5	"
Other Banks.....	5	"
Private Individuals.....	5	"
Churches, etc.	4	"
	100	percent

Since the local banks held few mortgages on rural property they were not particularly interested in erosion control. Life insurance companies made no effort whatever to obtain the help of the service in this regard. The Federal Land Bank through its office in Louisville, Kentucky, arranged tours of the area to acquaint its local officers and borrowers with the erosion control methods. Tours of this nature were well attended and interest was high.

One of the most outstanding indications of community viewpoint was exhibited by the county agricultural agent and vocational agricultural teachers. Their assistance in making the rural population erosion conscious was invaluable.

The work of the service was not influenced by land values as affected by soil loss. There were only four rural properties on which the taxes were delinquent in 1940 and there was no conclusive evidence that soil loss had contributed to this delinquency.

Physical Land Characteristics and the Livestock Program

On many farms erosion control would have been much simpler if the type of farming enterprise could have been changed completely. This was often impossible because of the knowledge and experience of the farm owner or operator.

Landowners in the area susceptible to severe erosion were inclined to follow the same system of corn and hog farming followed by their neighbors who were in a much better position to produce pork from the standpoint of land capability.

Experience in the demonstration area to-date indicates that land owners should be encouraged to adopt a type of livestock suitable to the land. Recognition of erosion control, management and fertility practices suitable to the land and to the type of livestock encourages greater use of roughage consuming animals. A number of our cooperators are successfully replacing hogs with cattle and sheep. One of the difficulties experienced in this shift is the lack of suitable barn room for hay storage and roughage consuming livestock.

The use of timothy or other grass in combination with alfalfa and other deep-rooted legumes bears a relationship to the livestock program. Most cooperators were reluctant to add timothy to the legume seeding. By 1940 several had expressed their approval. Results as they affect livestock and as reported by cooperators are:

1. Higher quality hay because it cures better.
2. Hay is more palatable, stock eat it better.
3. Less danger of bloat when used as pasture.
4. Insures a better stand, hence more hay.
5. Hay stands up better in wet weather.

Permanent pastures are commonly used for hog pasture but are rather unsuitable. From the standpoint of erosion control hogs are detrimental to permanent pastures because they root up the sod, resulting in a poor sod and more soil loss. In situations where rotation fields are not available or properly fenced for hog pasture the most desirable plan is to provide several small lots close to the buildings or water which can be used for hogs exclusively and a suitable rotation established to control disease and parasites.

The number and kind of livestock offer a problem in regard to protected areas such as woodland or new plantings. Fences must be particularly well-constructed, especially where they cross water courses as this is the most likely point from which livestock may enter these areas. Well fenced and protected areas sometimes invite misuse. They may be the most nearly hog tight areas on the farm and because of the shade there is a natural desire to use such places for sows at farrowing time. This problem has presented itself in at least three cases in the demonstration area. If such areas are along the road it might be practicable to remove the road fence, or if not near the road any other fence not adjacent to a pastured area might be removed so that livestock cannot be confined to the area.

PROBLEMS REQUIRING FURTHER STUDY

Tillage Implements

The development of a tillage implement for row crops which would encourage water retention deserves attention. Implements in common use form open furrows which facilitate rapid run-off. Even though tillage may be planned to follow the contour the topography makes it impossible to keep the rows entirely on the level and run-off continues to follow these open furrows. If instead of an open furrow, the tillage implement would form a series of small pockets or depressions the run-off might be decreased or prevented. The implement should leave the ground in such condition as not to hinder the seeding of wheat or other winter grain in standing corn.

Small Grain Crops

The possibility of more general use of winter grain crops as a substitute for corn might be considered.

The use of such crops might result in better use of labor and equipment throughout the year, cheaper production costs, and decrease in soil loss. One cooperator has begun the production of winter barley during the past two years. In his case he likes the crop because it matures ahead of wheat or other small grains, is an excellent companion crop for legumes, and the grain substitutes for corn in the ration for swine. There is also the possibility of using such crops for late fall and early spring pasture.

The use of small grains and soybeans for grain singly or in combination with hay and pasture crops on land unsuited for row crops needs further study. The effect on soil loss, farm income and livestock production might be considered.

Forage Crops

Climate and soil are well adapted to the production of alfalfa or alfalfa-grass mixtures. All that is lacking is the use of marl or limestone as a soil amendment and an adequate fertility program. Both marl and limestone are readily accessible. A study should be made of the economic returns which might be expected from a well managed pasture and hay system as compared to a corn-hog system on farms susceptible to severe soil loss.

The Pasture Program

Most farm operators like to have their livestock on pasture every day of the year, unless the weather is very cold or otherwise unfavorable. In contrast to this attitude farm planners have been inclined to consider the pasture season as about 6 months in length and have attempted to provide hay for the other 6 months of the year.

Further study needs to be made of the possibility of lengthening the pasture season. Crops suitable for grazing in late fall, winter, or early spring should cheapen livestock production and decrease soil loss.

OBSERVATIONS AND RECOMMENDATIONS OF THE SOIL CONSERVATION SERVICE

The Conservation Attitude

The application of soil saving methods cannot succeed unless there is a genuine realization of the need for such methods by the land owner or operator. Erosion is a new word and a new idea to most people in central Indiana. On almost every farm tour some one has asked the question, "If I have lost the topsoil or the topsoil and subsoil from some part of my farm, what can I put on it to make it produce as well as the rest?" The answer, of course, is more topsoil, but the operator tends to overlook or discredit this prescription. He still has hope in some special crops or soil treatment which will overcome the disadvantage of soil loss.

Because of their short-time viewpoint, most operators are unable to conceive the infinitely slow process by which soil is made in relation to the rapid loss which has attended a few generations of cultivation.

Education is the obvious need. More effort should be devoted to acquainting the grade and high school students with the land. Vocational teachers should be supplied with and encouraged to use material already available for this purpose.

Simple demonstrations might be conducted by vocational teachers or the Extension Service to show the effect of soil loss on crop yields. This should prove no more difficult than checking the yield of corn variety tests or the results of fertility treatment.

Local civic organizations should be encouraged to sponsor soil saving practices. Most central Indiana towns are largely dependent upon the continued well-being of rural communities and are, therefore, directly influenced by soil exploitation.

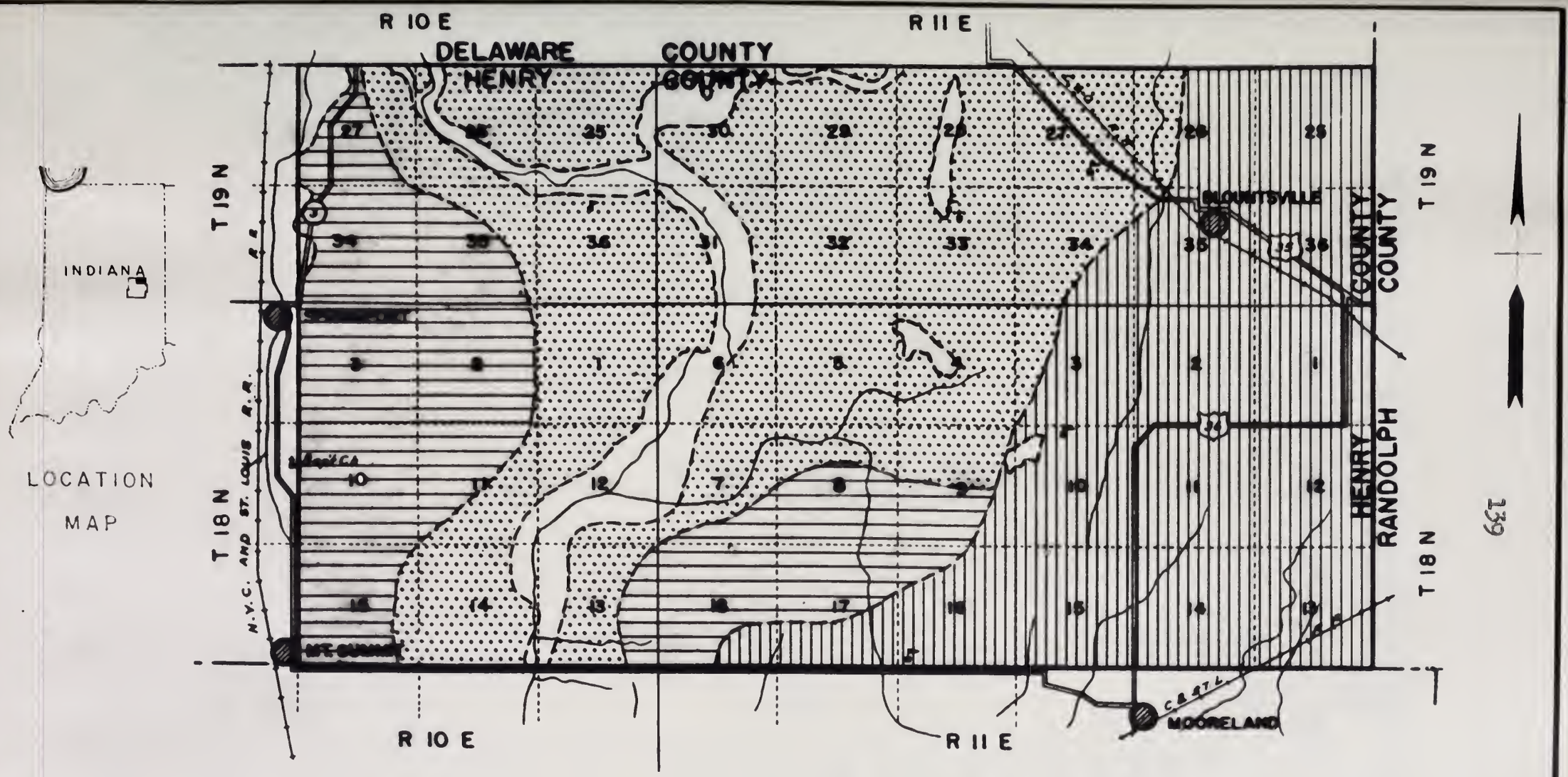
Conservation is an attitude of life. It is not acquired on suggestion. The application of new crops, new methods and new machinery can be as effective a contribution to conservation of soil resources as to improved farm income. For example, the use of farm tractors had greatly speeded up farm operations. With the help of tractors the fall work, such as corn picking, is often completed before winter weather. Consequently some operators are inclined to plow their corn ground in the fall and allow it to lie bare over winter. This practice may be satisfactory for level land, but is questionable on rolling land. The same tractor which makes it possible to plow corn ground in the fall, would also make it possible to keep the ground covered and protected from soil loss. Cover crops or aftermath could be left undisturbed as a protection against soil and water loss. Early spring growth would contribute much needed organic matter to the soil which would otherwise be lost through fall plowing.

Conservation Action

The application of conservation measures may be encouraged by the formation of a soil conservation district. This means of approaching the problem from a community standpoint offers an effective means of dealing with the entire problem of conserving soil and moisture through proper use. The state of Indiana encouraged this method when it passed the State Soil Conservation Districts Law, in 1937. Already several areas in the state have taken advantage of their privileges under this law and are receiving technical assistance through an agreement with the federal and state governments.

Methods of erosion control demonstrated on this project offer the best solutions that are known to-date. They are not all inclusive nor infallible. New methods will be discovered as people devote more active interest to this nation-wide problem.

In a general way the most effective means for central Indiana seem to be concerned with changes in the use of the land to conform with its capability. These changes should be supported by simple farm practices which are already known and in some cases used and in addition such practices as contour tillage, the use of diversion ditches, the use of strip cropping wherever possible, and the application of careful management systems for woodland and pasture land. To be successful, they must be planned so as to fit the farm, the farmer and the economic and social conditions in the community. Under such conditions the application of erosion control measures will assure a more lasting agriculture and greater security and enjoyment for both the rural and the urban population.



NATIVE VEGETATIVE COVER MAP

BASED ON ORIGINAL GOVERNMENT SURVEY.



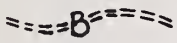
SYMBOLS FOR LAND USE MAPS

UNITED STATES DEPARTMENT OF AGRICULTURE — SOIL CONSERVATION SERVICE

Property Boundary

Field Boundary


Crop Boundary

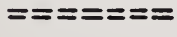

Buffer Strips, drawn in place

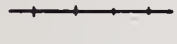
Watershed Boundary

Paved Highway

Improved Road

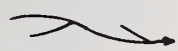
Gravel Road


Private Road or Lane


Railroad, Single Track


Direction of Cultivation


Stream, Intermittent


Stream, Small Perennial


Stream, Large Perennial


Sod Drainage Ways or Terrace Outlets


Diversion Ditch


Terrace, drawn in place


Terrace, Bench (rock winrow)



Contour, Base row


Permanent Pond


Intermittent Pond

Fence on Property Line

Fence, Present

Fence, New

Relocated Fence

Occupied Building

Unoccupied Building

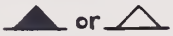

School


Church


Mine Shaft


Cemetery


City or Town



CCC Camp


Spring


Dam



Field No., Acreage


Gravelly Area


Stony Area


Rock Outcrop


Depression

A - Land Removed from Cultivation

F - Forest or Woodland Planting (new)

H - Wildlife Work

L - Cultivated or Rotation Land

M - Permanent Sod Waterways

N - Grasses or Perennial Legumes for hay

O - Orchard

P - Pasture

W - Woodland, established timber, protected from grazing

X - Idle Land

Z - Miscellaneous Crops, Truck, Etc.

Legend for Conservation Survey Maps

Symbols designating sheet erosion.

Symbol or Class	Erosion conditions
2	0-25% of the topsoil removed
3	25-50% of the topsoil removed
33	50-75% of the topsoil removed
4	75-100% of topsoil removed and may include upper part of subsoil
5	Lower subsoil or parent material eroded
6	Supplementary-undifferentiated erosion used on urban areas, farmsteads, wide highways, etc., un-important erosion.
≠	Alluvial deposition

Symbols designating gully erosion.

Symbol or Class	Erosion conditions
7	Average of 3 gullies, or less, per acre or gullies 100' apart laterally
8	Average of more than 3 gullies per acre, or gullies less than 100' apart laterally, but less than 75% of the area gullied
9	75% or more of the area gullied

(Note: Symbol 7 and 8 used with sheet erosion symbols refer to gullies that can be crossed by tillage implements. Symbol 9 is used without other erosion symbols. Symbols ⑦ ⑧ ⑨ - gullies that cannot be crossed with farm implements.)

Symbols showing the use of the land.

Symbol	Land use
L	Cultivated land
P_1	Above average pasture
P_2	Average pasture
P_3	Below average pasture
X	Idle land
$\overline{F}$	Woodland grazed
F	Woodland
H	Supplementary class, farmsteads, wide highways, etc.

Symbols showing the slope of the land.

Symbol	Percent of slope
A	0-3
B	3-10
C	10-20
D	20% and up

(Note: Symbols such as 7B, 15C and 35D, when used show the dominating percent of slope in the area, so designated in addition to the general slope classification.

The symbol K replaces the symbols B or C where the topography is hummocky. It indicates that contour cultivation is impossible with usual tillage methods and machinery.)

The above information is shown on maps by a composite symbol, as follows:

$$\frac{\text{Erosion - Land Use}}{\text{Slope} \qquad \text{Soil}} \quad \text{Thus} \quad \frac{3 - L}{7B - 4}$$

Symbols designating names of soils.

The following information on soils is taken directly from the last inspection report and is as follows:

	Field Name	Proposed Name[10]
2	Crosby silt loam	Crosby silt loam
4	Miami silt loam	Miami silt loam
5	Bellfontaine silt loam	Bellefontaine silt loam
6	Light colored deposition 16 inches deep -- found on valley black lands	Washtenaw silt loam
68	Light colored deposition 16 inches deep over black upland (e.g. Brookston)	Washtenaw silt loam
7	Deposition over 16 inches deep -- any location -- poor drainage	Washtenaw silt loam, poorly drained
8	Brookston silty clay loam	Brookston silty clay loam
33	Eel silt loam	Eel silt loam
34	Genesee silt loam	Genesee silt loam
22	Homer silt loam	Homer silt loam
23	Fox sandy loam	Fox loam
24	Fox silt loam, deep phase	Fox silt loam, deep phase
25	Fox silt loam	Fox silt loam
25	Fox silt loam	
26	Soils shallow to gravel	Fox loam
28	Westland silty clay loam.	Westland silty clay loam

[10] These proposed names are subject to final correlation.

29	Abington silty clay loam	Abington silty clay loam
40	Muck	
41	Walkill silt loam	Walkill silt loam
1	Warners--marl--any location	Warners silt loam

Under the above field name, No. 26 was combined with No. 23 and appears on the maps as No. 23. Necessary corrections have been made on the maps.

Table 14. Land use capability, Blountsville Project

Soil or Soil Group	Slope	Erosion Classes	Erosion Group	Land Use Capability I	II	III	IV	V
Brown to reddish brown light colored soils. Well drained, normal profile development. Upland soils Miami and Bellefontaine, terrace soil, Fox. All soils are silt loam except Fox which is silt loam or loam.	A 0-3	∕, 2	Slight	I				
		27,3	Moderate		II			
	B 3-10	∕,2,27,3, 37	Slight to Moderate		II			
		2⑧, 38, 33, 337, 33⑦	Moderate to Severe			III		
		4, 47, 4⑦ 48	Very Severe				IV	
	C 10-20	2,27,28,3, 38,33,337, 33⑦	Slight to Severe				IV	
		4,47,4⑦ 48, 4⑧, 5,57,9	Very Severe					V
	D 20 & Up	All Classes						V
Light colored upland or second bottom soils, with relatively tight subsoils which contribute to poor underdrainage. Soil types Crosby and Homer. Both soil types are silt loams	A 0-3	∕, 2	Slight	I				
		27,3	Moderate		II			
	B 3-10	2,3,37	Slight to Moderate		II			
Dark colored upland or bottom soils, near neutral in reaction. Better than average fertility for soils in the area. Soil types-Brookston, Westland, and Abington silty clay loams and Muck.	A 0-3	∕, 2	Slight	I				
		27, 3	Moderate		II			
	B 3-10	∕, 2	Slight		II			
		27, 3	Moderate		II			
Alluvial soils and marl. Washtenaw is formed from recent light colored deposition or wash, being deposited on dark colored soils or black land. Walkill is similar to the above but deposited on Muck. Older light colored alluvium or wash, is called Genesee and Eel. This group also includes Warners (marl)	A 0-3	∕, 2	Slight	I				
	B 3-10	∕, 2	Slight		II			

Cont.

Table 14. Cont.

Soil or Soil Group	Slope	Erosion Classes	Erosion Group	Land Use Capability				
				I	II	III	IV	V
Miami silt loam	A 0-3	1, 2	Slight	I				
		27,3	Moderate		II			
	B 3-10	1,2,27, 2⑧, 3	Slight to Moderate		II			
		38,33,337, 33⑦	Moderate to Severe			III		
		4,47, 4⑦, 48	Very Severe				IV	
	C 10-20	1,2,27,2⑧ 3,38,33, 337, 33⑦	Slight to Severe				IV	
		4,47, 4⑦, 48, 4⑧, 5, 57,9	Very Severe					V
	D 20 & Up	All Classes						V
Bellefontaine silt loam	A 0-3	1,2	Slight	I				
		27,3	Moderate		II			
	B 3-10	1,2,27	Slight to Moderate		II			
		2⑧, 3,38 33, 337, 33⑦	Moderate to Severe			III		
		4,47, 4⑦	Very Severe				IV	
	C 10-20	2,27,2⑧ 3,38,33, 337, 33⑦	Slight to Severe				IV	
		4,47, 4⑦ 4⑧ 5,57,9	Very Severe					V
	D 20 & up	All Classes						V

Cont.

Table 14. Cont.

Soil or Soil Group	Slope	Erosion Classes	Erosion Group	Land Use Capability				
				I	II	III	IV	V
Fox silt loam Fox loam	A 0-3	1, 2	Slight	I				
		27,3	Moderate		II			
	B 3-10	2,27,3,37, 33	Slight to Severe		II			
	C 10-20	2,27,3,37, 38,33	Moderate to Severe				IV	
		All other Classes	Very Severe					V
	D 20 & Up	All Classes						V
Crosby silt loam Homer silt loam	A 0-3	1,2	Slight	I				
		3	Moderate		II			
	B 3-10	2,3	Slight to Moderate		II			
Brookston) silty Westland) clay Abington) loam Muck	A 0-3	1,2	Slight	I				
		27,3	Moderate		II			
	B 3-10	1,2	Slight		II			
		27,3	Moderate		II			

Cont.

Table 14. Cont.

Soil or Soil Group	Slope	Erosion Classes	Erosion Group	Land Use Capability				
				I	II	III	IV	V
Walkill Washtenaw	A 0-3	≠,2	Slight	I				
	B 3-10	≠,2	Slight		II			
Warners silt loam	A 0-3	≠,2	Slight	I				
	B 3-10	≠,2	Slight		II			
Genesee) Eel) silt loams	A 0-3	≠, 2	Slight	I				

Table 15. Land use capability classes and recommendations

Soil Group Characteristics						
Brown to reddish brown - light colored soils. Well drained, normal profile development. Upland soils. Miami and Bellefontaine, terrace soil, Fox. All soils are silt loam except Fox which is silt loam or loam.						
L.U. Capability Class	Slope	Erosion	Recommendations			
			Priority of use	Rotation	Special Practices	Fertility Practices and Soil Amendments
I	A 0-3	slight	1. Cropland	R.G.M.[1]	None	Lime and fertilizer to be applied according to test and Experiment Station recommendations. Return to the soil all crop residues. See page 168.
			2. Grassland	Grass-legume mixture	None	
			3a. Woodland		For established woods, protection from fire and grazing. Group selection system of cutting for management.	
			3b. Wildlife			Preservation of natural vegetation on areas not used for crops as stream banks, draws, brushy patches, fence rows, planting locally lifted wild roses, hazelnut, etc. where cover is needed.

[1] See page 167 for definition of symbols in rotation column.

Table 15. Land use capability classes and recommendations

Soil Group Characteristics						
Brown to reddish brown - light colored soils. Well drained, normal profile development. Upland soils. Miami and Bellefontaine, terrace soil, Fox. All soils are silt loam except Fox which is silt loam or loam.						
L. U. Capability Class	Slope	Erosion	Recommendations			
			Priority of use	Rotation	Special Practices	Fertility Practices and Soil Amendments
II	A 0-3	Moderate	1. Cropland	R.G.M.	Sod waterways in critical areas or diversion of run-off water from higher areas by diversion ditch. General cross slope cultivation where practical.	Lime and fertilizer to be applied according to test and Experiment Station recommendations. Return to the soil all crop residues. See page 168.
			2. Grassland	Grass legume mixture	None	
			3a. Woodland		For established woods, protection from fire and grazing. Group selection system of cutting for management.	
			3b. Wildlife			Preservation of natural vegetation on areas not used for crops as stream banks, draws, brushy patches, fence rows, planting locally lifted wild roses, hazelnut, etc. where cover is needed.

Table 15. Land use capability classes and recommendations

Soil Group Characteristics Brown to reddish brown - light colored soils. Well drained, normal profile development. Upland soils. Miami and Bellefontaine, terrace soil, Fox. All soils are silt loan except Fox which is silt loam or loam.						
L.U. Capability Class	Slope	Erosion	Recommendations			
			Priority of use	Rotation	Special Practices	Fertility Practices and Soil Amendments
II	B 3-10	slight to moderate	1. Cropland	1.R.G.M.M. 2.R.G.M.	Sod waterways in all important waterways. Contour seeding and cultivation wherever possible. Contour strip cropping with 100 foot strips in cases where the slope is 300 feet long or longer. Field diversions where practical.	Lime and fertilizer to be applied according to test and Experiment Station recommendations. Return to the soil all crop residues. See page 168.
			2. Grassland	Grass legume mixture	Careful grazing dependent upon vigor of cover and season.	Topdress with fertilizer and manure. Lime, disc poor sods and seed to deep rooted drought-resistant legumes.
			3a. Woodland		Same as Class I for established woods. Species for planting generally to be black locust. Pine to be used only on slight to moderately eroded areas.	Fertilization of black locust recommended. Use 2 ounces high phosphorus fertilizer.
			3b. Wildlife			Preservation of natural vegetation on areas not used for crops as stream banks, draws, brushy patches, fence rows, planting locally lifted wild roses, hazelnut, etc., where cover is needed.

Table 15. Land use capability classes and recommendations

Soil Group Characteristics						
Brown to reddish brown - light colored soils. Well drained, normal profile development. Upland soils, Miami and Bellefontaine, terrace soil, Fox. All soils are silt loam except Fox which is silt loam or loam.						
L.U. Capability Class	Slope	Erosion	Recommendations			
			Priority of use	Rotation	Special Practices	Fertility Practices and Soil Amendments
III	B 3-10	Moderate to Severe	1. Cropland	1.[2] G.M.M.M.M. 2.S.B.G.M.M. 3.R.G.M.M.M.M.	Establish sod cover in all important waterways. Contour seeding and cultivation on slopes less than 300 feet long. Contour strip cropping with strips 80 feet wide wherever the slope is 300 feet long or longer. Diversion ditches where practical.	Lime and fertilizer to be applied according to test and Experiment Station Recommendations. Return to the soil all crop residues. See page 168.
			2. Grassland	Grass legume mixture	Careful grazing dependent upon vigor of the cover and season. Control of gully erosion by sloping, seeding and fertilizing followed by temporary protection from grazing.	See IIB, 3-10, grassland.
			3a. Woods		Same as Class I for established woods. Use of sawdust and straw recommended on severely eroded areas. Also use of sawdust mixed in hole suggested. Use black locust only.	Fertilization of black locust recommended. Use 2 ounces high phosphorus fertilizer.

[2]Special rotation for the control of soil and water loss. Well adapted for very irregular slopes.

Table 15. Land use capability classes and recommendations

Soil Group Characteristics						
Brown to reddish brown - light colored soils. Well drained, normal profile development. Upland soils, Miami and Bellefontaine, terrace soil, Fox. All soils are silt loam except Fox which is silt loam or loam.						
L.U. Capability Class	Slope	Erosion	Recommendations			
			Priority of use	Rotation	Special Practices	Fertility Practices and Soil Amendments
III	B 3-10	Moderate to severe	3b. Wildlife			Preservation of natural vegetation on areas not used for crops, as stream banks, draws, brushy patches, fence rows. Planting locally lifted wild roses, hazelnut, etc., where cover is needed.
IV	B 3-10	Very severe	1. Grassland (a) Meadow	Grass legume mixture to be plowed only as necessary to renew.	Sod waterways	Lime and fertilizer to be applied according to test and Experiment Station recommendations. Return to the soil all crop residues. See page 168.

Table 15. Land use capability classes and recommendations

Soil Group Characteristics						
Brown to reddish brown - light colored soils. Well drained, normal profile development. Upland soils Miami and Bellefontaine, terrace soil, Fox. All soils are silt loam except Fox which is loam or silt loam.						
L.U. Capability Class	Slope	Erosion	Recommendations			
			Priority of use	Rotation	Special Practices	Fertility Practices and Soil Amendments
IV	B 3-10	Very severe	(b) Pasture	Grass legume mixture	Contour furrows to retain water at top of slope or diversion ditch to divert water from gullied areas. Careful grazing dependent upon vigor of the cover and season. Control of gully erosion by sloping, seeding and fertilizing followed by temporary protection from grazing. Renovation with introduction of deep-rooted drought-resistant legumes such as alfalfa, sweet clover or red clover.	See II B, 3-10, grassland.
			2a. Woodland		Protection of woods from fire and grazing. Mulch heavily very severe eroded areas. Sawdust and straw. Recommend use of sawdust mixed with some topsoil to reduce high lime influence placed in planting hole. Use black locust only.	Fertilization of black locust recommended. Use 2 ounces high phosphorus fertilizer. Group selection system cutting.

Table 15. Land use capability classes and recommendations

Soil Group Characteristics Brown to reddish brown - light colored soils. Well drained, normal profile development. Upland soils Miami and Bellefontaine, terrace soil, Fox. All soils are silt loam except Fox which is loam or silt loam.						
L. U. Capability Class	Slope	Erosion	Recommendations			
			Priority of use	Rotation	Special Practices	Fertility Practices and Soil Amendments
IV	B 3-10	Very severe	2b.Wildlife			Same as class I recommendations. In addition eroded areas mulched and planted to woody or herbaceous plants as adapted pines, lespedezas and woody plants, use fertilizer where needed.
			3. Cropland	1.G.M.M.M.M.M.	Establish sod cover in all important waterways. When reseeding becomes necessary strips 80 feet wide may be used on slopes 300 feet or longer.	
IV	C 10-20	Slight to severe	1. Grassland (a)Pasture	Grass legume mixture	Contour furrows to retain water at top of slope or diversion ditch to divert water from gullied areas. Careful grazing dependent upon vigor of cover and season. Control of gully erosion by sloping, seeding and fertilizing followed by temporary protection from grazing. Renovation with introduction of deep rooted legumes such as alfalfa, sweet clover or red clover.	See IIB, 3-10 Grassland.

Table 15. Land use capability classes and recommendations

Soil Group Characteristics						
Brown to reddish brown - light colored soils. Well drained, normal profile development. Upland soils Miami and Bellefontaine, terrace soil, Fox. All soils are silt loam except Fox which is loam or silt loam.						
L. U. Capability Class	Slope	Erosion	Recommendations			
			Priority of use	Rotation	Special Practices	Fertility Practices and Soil Amendments
IV	C 10-20	Slight to severe	1. Grassland (b)Meadow	Grass legume mixture to be plowed only as necessary to renew, may be used for hay or pasture	Sod waterways. These slopes are short but steep. They should be plowed and renewed at a time when the balance of the field or watershed above is in meadow	
			2a.Woodland		Protection from fire and grazing and management to develop cover to control soil and water loss.	
			2b.Wildlife			Same as Class I recommendations. In addition eroded areas mulched and planted to woody or herbaceous plants as adapted pines, lespedezas and woody plants. Use fertilizers where needed.

Table 15. Land use capability classes and recommendations

Soil Group Characteristics						
Brown to reddish brown - light colored soils. Well drained, normal profile development. Upland soils Miami and Bellefontaine, terrace soil, Fox. All soils are silt loam except Fox which is loam or silt loam.						
L. U. Capability Class	Slope	Erosion	Recommendations			
			Priority of use	Rotation	Special Practices	Fertility Practices and Soil Amendments
V	C 10-20 also D 20-up	Very severe All classes of erosion from slight to very severe	1a. Woodland		Protection from fire and grazing and management to develop cover to control soil and water loss. Reforestation of eroded areas.	
			1b. Wildlife			Same as Class I recommendations. In addition eroded areas mulched and planted to woody or herbaceous plants as adapted pines, lespedezas and woody plants. Use fertilizers were needed.
			2. Grassland (a) Pasture	Grass legume mixture	Careful grazing dependent upon vigor of cover and season. Control of gully erosion by sloping, seeding, fertilizing and liming followed by temporary protection from grazing.	

Table 15. Land use capability classes and recommendations

Soil Group Characteristics Brown to reddish brown - light colored soils. Well drained, normal profile development. Upland soils Miami and Bellefontaine, terrace soil, Fox. All soils are silt loam except Fox which is loam or silt loam.						
L. U. Capability Class	Slope	Erosion	Recommendations			
			Priority of use	Rotation	Special Practices	Fertility Practices and Soil Amendments
					(continued)	
V	C 10-20 also D 20- up	Very severe All classes of erosion from slight to very severe	2. Grassland (a)Pasture		Renovation with introduction of deep-rooted drought-resistant legumes such as alfalfa, sweet clover or red clover. Diversion ditches and contour furrows are not recommended on slopes of more than 20 percent.	

Table 15. Land use capability classes and recommendations

Soil Group Characteristics						
Light colored upland or second bottom soils, with relatively tight subsoils which contribute to poor under drainage. Soil types - Crosby and Homer. Both soil types are silt loam.						
L.U. Capability Class	Slope	Erosion	Recommendations			
			Priority of use	Rotation	Special Practices	Fertility Practices and Soil Amendments
I	A 0-3	slight	1.Cropland	1.R.G.M. 2.R.G.M.M. 3.R.SB.G.M.	None	Lime and fertilizer to be applied according to test and experiment Station recommendations. Return of all crop residues to the soil. See page 168.
			2.Grassland (a)Pasture	Grass legume mixture	None	Lime and fertilizer to be applied according to test and Experiment Station recommendations. Return of all crop residues to the soil. See page 168.
			3a.Woods		Protection of established woods from fire and grazing. Group selection system of cutting for management. No planting recommended except for windbreaks around buildings.	
			3b.Wildlife			Preservation of natural vegetation in areas not used for crops.

Table 15. Land use capability classes and recommendations

Soil Group Characteristics						
Light colored upland or second bottom soils, with relatively tight subsoils which contribute to poor under drainage. Soil types - Crosby and Homer. Both soil types are silt loam.						
L. U. Capability Class	Slope	Erosion	Recommendations			
			Priority of use	Rotation	Special Practices	Fertility Practices and Soil Amendments
II	A 0-3	moderate	1.Cropland	1.R.G.M.M. 2.R.SB.G.M.	Sod waterways to carry run-off.	Lime and fertilizer to be applied according to test and Experiment Station recommendations. Return of all crop residues to the soil. See page 168.
			2.Grassland (a)Pasture	Grass legume mixture	Careful grazing dependent upon vigor of cover and season	
			3a.Woods		Same as Class I.	
			3b.Wildlife			Preservation of natural vegetation in areas not used for crops.
II	B 3-10	slight to moderate	1.Cropland	1.R.G.M.M.	Sod waterways to carry run-off. Contour planting, seeding and cultivating. Strip cropping if in a position to operate with other land subject to erosion loss or if slope is 300 or more feet long. Width of strips about 100 feet. Drainage type diversion terrace on long slopes where practical.	Lime and fertilizer to be applied according to test and Experiment Station recommendations. Return of all crop residues to the soil. See page 168.

Table 15. Land use capability classes and recommendations

Soil Group Characteristics Light colored upland or second bottom soils, with relatively tight subsoils which contribute to poor under drainage. Soil types - Crosby and Homer. Both soil types are silt loam.						
L. U. Capability Class	Slope	Erosion	Recommendations			
			Priority of use	Rotation	Special Practices	Fertility Practices and Soil Amendments
II	B 3-10	slight to moderate	2.Grassland (a)Pasture	Grass legume mixture	Careful grazing dependent upon vigor of cover and season. Sloping of gully banks, fertilization, seeding and temporary protection from grazing.	
			3.Woods		Same as Class II.	

Table 15. Land use capability classes and recommendations

Soil Group Characteristics Dark colored upland or bottom soils, near neutral in reaction. Better than average fertility for soils in the area. Soil types -- Brookston, Westland and Abington silty clay loams, and Muck.						
L. U. Capability Class	Slope	Erosion	Recommendations			
			Priority of use	Rotation	Special Practices	Fertility Practices and Soil Amendments
I	A 0-3	slight	1. Cropland	1.R.G.M. 2^{3}. R.G. (Legume)		Lime and fertilizer to be applied according to test and Experiment Station recommendations. Return of all crop residues to the soil. See page 168.

[3] This is a 2-year rotation with deep rooted legumes seeded in the small grain. The legume occupies the land during the summer, fall and winter following the grain crop and is plowed under preceding corn.

Table 15. Land use capability classes and recommendations

Soil Group Characteristics Dark colored upland or bottom soils, near neutral in reaction. Better than average fertility for soils in the area. Soil types -- Brookston, Westland and Abington silty clay loams, and Muck.						
L. U. Capability Class	Slope	Erosion	Recommendations			
			Priority of use	Rotation	Special Practices	Fertility Practices and Soil Amendments
I	A 0-3	slight	2.Grassland (a)Pasture	Grass legume mixture		
			3a.Woodland		Where woods are established recommend the best portion be protected from fire and grazing. Group selection system of cutting for management. No planting recommended except for windbreak around buildings.	
			3b.Wildlife			Preservation of natural vegetation in areas not used for crops.
II	A 0-3 B 3-10	moderate slight to moderate	1.Cropland	1.R.G.M.	Sod waterways in important water courses, or diversion ditch at top of slope to prevent excess surface overwash from steeper land above. Planting and cultivation conducted generally across the slope. Contour cultivation on B slopes.	Lime and fertilizer to be applied according to test and Experiment Station recommendations. Return all crop residues to the soil. See page 168.

Table 15. Land use capability classes and recommendations

Soil Group Characteristics						
Dark colored upland or bottom soils, near neutral in reaction. Better than average fertility for soils in the area. Soil types -- Brookston, Westland and Abington silty clay loams and Muck.						
L.U. Capability Class	Slope	Erosion	Recommendations			
			Priority of use	Rotation	Special Practices	Fertility Practices and Soil Amendments
II	A 0-3 B 3-10	moderate slight to moderate	2.Grassland (a)Pasture This use is recommended where excess surface run-off from higher land or adjacent drainage course render the land unsuited for cultivation.	Grass legume mixture	Careful grazing dependent upon season, vigor and quality of cover.	Lime and fertilizer to be applied according to test and Experiment Station recommendations. Return of all crop residues to the soil. See page 168.
			3a.Woodland		Where woods are established, recommend the best portion to be protected from fire and grazing. Group selection system of cutting for management. No planting recommended except for windbreak around buildings.	
			3b.Wildlife			Preservation of natural vegetation in areas not used for crops.

Table 15. Land use capability classes and recommendations

Soil Group Characteristics						
Alluvial soils and marl. Washtenaw is formed from recent light colored deposition or wash, being deposited on dark colored soils or black land. Walkill is similar to above but deposited on muck. Older light colored alluvium or wash, is called Genesee and Eel. This group also includes Warners (marl).						
L.U. Capability Class	Slope	Erosion	Recommendations			
			Priority of use	Rotation	Special Practices	Fertility Practices and Soil Amendments
I	A 0-3	Deposition to slight erosion	1.Cropland	1.R.G.M. 2.R.G. (legume)		Lime and fertilizer to be applied according to test and Experiment Station recommendations. Return of all crop residues to the soil. See page 168.
			2.Grassland (a)Pasture	Grass legume mixture	None	Lime and fertilizer to be applied according to test and Experiment Station recommendations. Return of all crop residues to the soil. See page 168.
			3.Wildlife			Preservation of natural vegetation on areas not used for crops as stream banks, draws, brushy patches, fence rows.

Table 15. Land use capability classes and recommendations

Soil Group Characteristics						
Alluvial soils and marl. Washtenaw is formed from recent light colored deposition or wash, being deposited on dark colored soils or black land. Walkill is similar to above but deposited on muck. Older light colored alluvium or wash, is called Genesee and Eel. This group also includes Warners (marl).						
L. U. Capability Class	Slope	Erosion	Recommendations			
			Priority of use	Rotation	Special Practices	Fertility Practices and Soil Amendments
II	B 3-10	slight	1.Cropland	1.R.G.M. 2.R.G. (legume)	Sod waterways in drainage courses. Planting and cultivation conducted generally across the slope.	Lime and fertilizer to be applied according to test and Experiment Station recommendations. Return of all crop residues to the soil. See page 168.
			2.Grassland (a)Meadow (b)Pasture	Mixture of deep rooted legumes and suitable grasses for hay or pasture Grass legume mixture.		
			3a.Woods		Planting only for special cases of erosion control.	
			3b.Wildlife			Preservation of natural vegetation on areas not used for crops as stream banks, draws, brushy patches, fence rows.

DEFINITION OF SYMBOLS IN ROTATION COLUMN

R. Corn or any other crop planted in rows and cultivated such as tomatoes, beans, etc.

G. Small grains, winter wheat, rye or winter barley or winter oats if adaptable. May also include spring oats on A slope, or in case of failure of other grain.

M. A mixture of deep rooted legumes such as red or alsike clover or alfalfa in combination with perennial grasses, such as timothy, orchard grass, redtop and smooth brome grass.

SB. Soybeans drilled solid, and used for hay or grain. If for grain the crop is combined and the straw remains on the ground.

Note regarding drainage: There are a few cases where additional drainage would benefit some soils in the area. However, drainage is a common accepted practice already in operation on most farms and therefore is not considered a special practice in these capability tables.

Table 16. Fertilizer recommendations

Soil Group	Corn		Small Grain		Meadows[1]		Grassland
	Rate	Analysis	Rate	Analysis	Rate	Analysis	400 lbs. of 0-20-0 for top-dressing or renovating old pastures with deep rooted legumes
	Pounds		Pounds		Pounds		
1. Well drained light colored soils	150	0-20-0	300	2-12-6	300	0-20-0	
2. Poorly drained light colored soils	150	0-14-6	300	2-12-6	---	---	---
3. Dark colored upland and bottom land soils	150	0-12-12	300	3-12-12	---	---	---
4. Alluvial soils and marl	150	0-14-6	300	2-12-6	---	---	(Usually unnecessary)

[1]Recommended treatment for grass-legume mixtures which are to occupy the land for three or more years and the crop removed as hay or pasture.

This table assumes that all manure will be returned to the soil and that rotations including legumes will be used as shown in the preceding recommendations.

Data obtained in part from "Fertilizers for Indiana Soils and Crops", Purdue University Agricultural Experiment Station Circular No. 162. May 1939.